IAQ Lesson Plans Index
Understanding the Indoor Environment

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	process of mechanical airflow.		
Lesson 8: Movement of Air Physical Model Activity	The purpose of this lesson is foster an understanding of mechanical airflow. Students will create physical models that demonstrate mechanical airflow.	3-12	68-71
Lesson 9: Identifying Indoor Environment Pollution Sources (List, Group, Label Activity)	The purpose of this activity is to develop an understanding for the causes of indoor air pollution. Students will categorize the causes of indoor air pollution using a list, group, label strategy.	4-12	72-75
Lesson 10: Preventing and Fixing Indoor Air Pollution Venn Diagram Activity	The purpose of this lesson is to develop solutions to indoor environment problems. Students will create a Venn Diagram comparing and contrasting solutions, determine if the solutions will prevent or fix the problems, and write a summary of the Venn Diagram.	3-12	76-79
Lesson 11: Invention Project	The purpose of this lesson is to allow students to demonstrate knowledge at the culmination of a unit of study about IAQ. Students will design inventions that will prevent or fix indoor environment problems.	4-12	80-84
Lesson 12: Magazine Publication Project	The purpose of this lesson is to allow students to demonstrate knowledge at the culmination of a unit of study about IAQ. Students will design and publish a magazine about IAQ.	2-5	85-89
Lesson 13: School Board Presentation	The purpose of this lesson is to allow students to demonstrate knowledge at the culmination of a unit of study about IAQ. Students will write and deliver speeches to inform school board members about IAQ problems and the importance of IAQ management plans in preventing and solving those problems.	4-12	90-94
Lesson 14: Vocabulary Development ABC Book	The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about IAQ. Students will create ABC books using IAQ vocabulary words.	3-8	95-103
Lesson 15: Vocabulary Development Deck of Word Cards	The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about IAQ. Students will be able to recall definitions of vocabulary words	4-12	104-106

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	by writing sentences using those words.		
Lesson 16: Vocabulary Development Dictionary Game	The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about IAQ. Using the main concept from the game "Balderdash", students will be able to learn new IAQ vocabulary words.	4-12	107-109
Lesson 17: Vocabulary Development Listening for Vocabulary Words	The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about IAQ. Students will use listening skills to identify IAQ vocabulary words.	3-8	110-112
Lesson 18: Vocabulary Development Acquiring New Vocabulary Through Discussion Groups	The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about IAQ. Using structured discussion groups, students will be able to locate unfamiliar words within an assigned text and determine their meaning using a variety of strategies (such as prior knowledge, context clues, group discussion, and media sources). Students will be able to acquire new vocabulary identified from the assigned text.	9-12	113-116
Lesson 19: Vocabulary Development Vocabulary Puzzles	The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about IAQ. Students will create and complete puzzles using the definitions of IAQ vocabulary words.	4-12	117-120
Lesson 20: Vocabulary Development Vocabulary Zoo	The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about IAQ. This is a whole class activity where students use listening skills to recall new IAQ vocabulary words and definitions.	K-5	121-123
Lesson 21: Vocabulary Development Word Walls	The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about IAQ. Students will be able to identify and define words that appear on the word wall.	K-12	124-127

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The purpose of this lesson is to introduce students to a unit of study on the topic of the indoor environment.

TOPIC(S)					
√	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS	√	SOURCES OF INDOOR AIR POLLUTION	√	MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
√	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS	√	SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY

OBJECTIVE(S)

The students will be able to list questions, vocabulary and key ideas to learn during a unit of study about the indoor environment. Students will brainstorm concepts related to the indoor environment, define the concept of the indoor environment, and list properties of the indoor environment.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry

- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives

- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND

3-5, 6-12 science

ESTIMATED TIME LENGTH

2-3 class periods

LESSON PROCEDURES

BACKGROUND

What is Indoor Air Quality (IAQ)?

This lesson allows students to plan an investigation into this topic using a PowerPoint style **IAQ in Schools Comic Book** (see Materials section) that was created to foster student understanding. After reading and discussing the

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comic book, the teacher will lead the students through the process of creating several graphic organizers to identify key ideas about the indoor environment.

What is a KWLH?

A KWLH is a teaching strategy that promotes active thinking and involvement during reading.

K - Stands for what we **KNOW** about the subject

W - Stands for what we **WANT** to learn

L - Stands for what we **LEARN** as we read

H - Stands for **HOW** we learned or plan to learn more (other sources might include the library, field trips, videos, Internet research)

PREPARATION

Prior to the lesson, post three pieces of chart paper in the front of the class. Label one piece with the heading "vocabulary", on one piece write the words "indoor environment" inside of a circle in the center of the page and on the last piece write the letters "KWLH" across the top of the page. Next, draw a line under the heading and lines going down to create a column under each letter (creating a KWLH chart).

VOCABULARY EXTRAPOLATION

Point out the chart with the words indoor environment written on it. Ask the students what they think this phrase means. Ask the students what an environment is. After a brief dialogue tell the students they will be learning about IAQ and you will begin by reading them a comic book about the topic. Tell the students there will be some unfamiliar words in the comic book and the first thing they need to do is extrapolate the unfamiliar words. Ask the students what the word extrapolate means? Tell the students that they are going to work in small groups to identify words in the comic book they need to learn more in order to understand the story. Split the class into small groups. Give each student a copy of the comic book and a highlighter. Have the students independently look through the comic book and highlight words they cannot define. After they highlight the words, have the students share the words within their small group. Designate one student in each group as the recorder and provide that student with a small pad of sticky notes. Have the students share their words by going through the comic book page by page and telling each other which words they have highlighted. If someone in the group knows the meaning of another student's word, then they can provide the definition during the group discussion. When there is a word that most of the group members have highlighted or that no one in the group can provide the definition for, have the recorder list that word on a sticky note and set it aside (one word per sticky). After the students complete the recording process, assign one student per group the task of reporting. As a whole class have the reporters take turns reporting their group's words on the sticky notes. Each reporter will provide one of their group's words per turn. If a word has already been mentioned by another

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group, then it does not need to be stated again. Repeat the process continuing in the same order until each reporter has reported all of the identified words. You will write the words on the chart paper that you labeled "vocabulary" as they are reported. At the conclusion of the reporting, tell the students they will revisit the list after reading the comic book to see what definitions they have learned by hearing the words in context. Revisit the chart during the final phase of the lesson.

KWLH CHART

Tell the students before reading the comic book you are going to record the information that they know already about IAQ under the K column of the chart that you have placed in the front of the classroom. After recording what they know, tell the students you are now going to record all of the questions they can generate under the W column. After recording what they want to learn, begin reading the comic book to the class using the PowerPoint version. As you read the comic book continue to list the student's additional questions under the W column. Tell the students that as you are reading to them, they may also be able to answer some of the questions. If this happens then list the answer under the L column beside the question. To record how the answer was learned, list "reading" under the H column next to the answer. After reading make a plan for the H column for all remaining questions.

QUESTIONING (during reading)

As you read the comic book ask the students questions to stimulate their thinking throughout the text. Ask students questions that encourage them to make predictions and set the purpose for reading. Listed below are some question stems to be used throughout the comic book.

- Page 2 – What do you think the other important environment is?
- Page 3 – How many hours of the day do you think we spend indoors?
- Page 5 – What do you think is in air?
- Page 7 – What word do we use to describe unclean air? Do you think that the air indoors can be polluted?
- Page 9 – What do we add to the indoor air that causes it to be unclean?
- Page 10 – What are some ways that a person's health could be affected by the unclean air?
- Page 12 – How does air get into your school? (this question is already appears on page 12)
- Page 14 – If we were to around our classroom and school, what are some things that we would want to look for that could contribute to indoor air pollution?
- Page 24 – If we were to go outside and look around the building, what are some things we would want to look for that could affect the quality of our air inside our school?

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INDOOR ENVIRONMENT CONCEPT WEB

Refer students back to the chart with the words "indoor environment" in the circle in the center of the chart. Tell students they are going to come up with as many words, phrases, and key ideas related to the words "indoor environment" as they can (by doing so they will be able to develop a definition for the indoor environment). Tell students that creating this web will help review what they have learned about IAQ from reading the comic book. As the students tell you the words, phrases, and key ideas related to the indoor environment, list them by drawing a line out from the center circle and writing the word, phrase or key idea. Continue this process to form the concept web. After the web is complete, give each individual student a piece of paper. Ask students to use the web to help them write a definition of the indoor environment. The definition should be a few sentences long. Collect the definitions. Ask the whole class to look at the web. Ask the students to dialogue in small groups to see if they notice any categories which could be made by grouping some of the words, phrases, or key ideas together. When you label the categories students suggest, attempt to match the eight key topics of IAQ (listed at the top of this lesson plan). Use different colored markers to draw lines and arrows to identify the categories on the concept web. Put the main category headings in boxes so they can be easily recognized when looking at the chart.

PLANNING AN INVESTIGATION

Using the concept web, KWLH charts, and vocabulary list, guide your students to plan a course of action for studying the indoor environment. The plan should address finding the answers to the remaining questions and defining the remaining vocabulary words. Guide their thinking in this process. You may choose to take their ideas and come up with the final course of study on your own. The students may elect to do independent research projects or divide into eight groups (each group may take one of the key topics listed above and develop a presentation for the class). Record the suggestions and put the plan in writing.

MATERIALS

markers, chart paper, masking tape, sticky notes (one small pad per group), **IAQ in Schools Comic Book**—one copy per student (see IAQ Lesson 1 Supplement_IAQ in Schools Comic Book.doc), writing paper, highlighters (one per student)

GROUPING

whole class, small group, independent

ASSESSMENT

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Teacher can assess the student's written definitions of the indoor environment. Teacher can informally assess comprehension and communication skills during discussions.

MODIFICATIONS/EXTENSIONS

Have students work in small cooperative learning groups to read the comic book and complete the KWHL chart and/or concept definition web. Have each small group study their assigned topic and then create and teach a lesson to the class. Have students work in partners to highlight the vocabulary words and/or write the definition of the indoor environment. At the conclusion of the lesson/unit have the students create their own comic book and/or redesign the illustrations in the comic book. Using available technology, have students turn the comic book into an animated short movie.

Short on time? Since time is so precious, if you are not able to implement this entire lesson, try these activities:

- *Share the comic book with the students and have a brief discussion*

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 3: Students apply a wide range of strategies to comprehend, interpret, evaluate, and appreciate texts. They draw on their prior experience, their interactions with other readers and writers, their knowledge of word meaning and of other texts, their word identification strategies, and their understanding of textual features (e.g., sound-letter correspondence, sentence structure, context, graphics)
- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

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Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators K-2
  8: Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)
  9: Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, and drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)
- Performance Indicators 3-5
  5: Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
  6: Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
  7: Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)
  8: Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
  9: Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)
- Performance Indicators 6-8
  4: Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)
  5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3 ,6)
  6: Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
  7: Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom.(4, 5)
  8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
  10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)
- Performance Indicators (9-12)
  5: Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)

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6: Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
7: Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)
8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
9: Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)
10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- **IAQ in Schools Comic Book**—provides an overview and introduction of the topic (see IAQ Lesson 1 Supplement_IAQ in Schools Comic Book.doc)
- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide (section 2, page 4) and IAQ Backgrounder (page 5)

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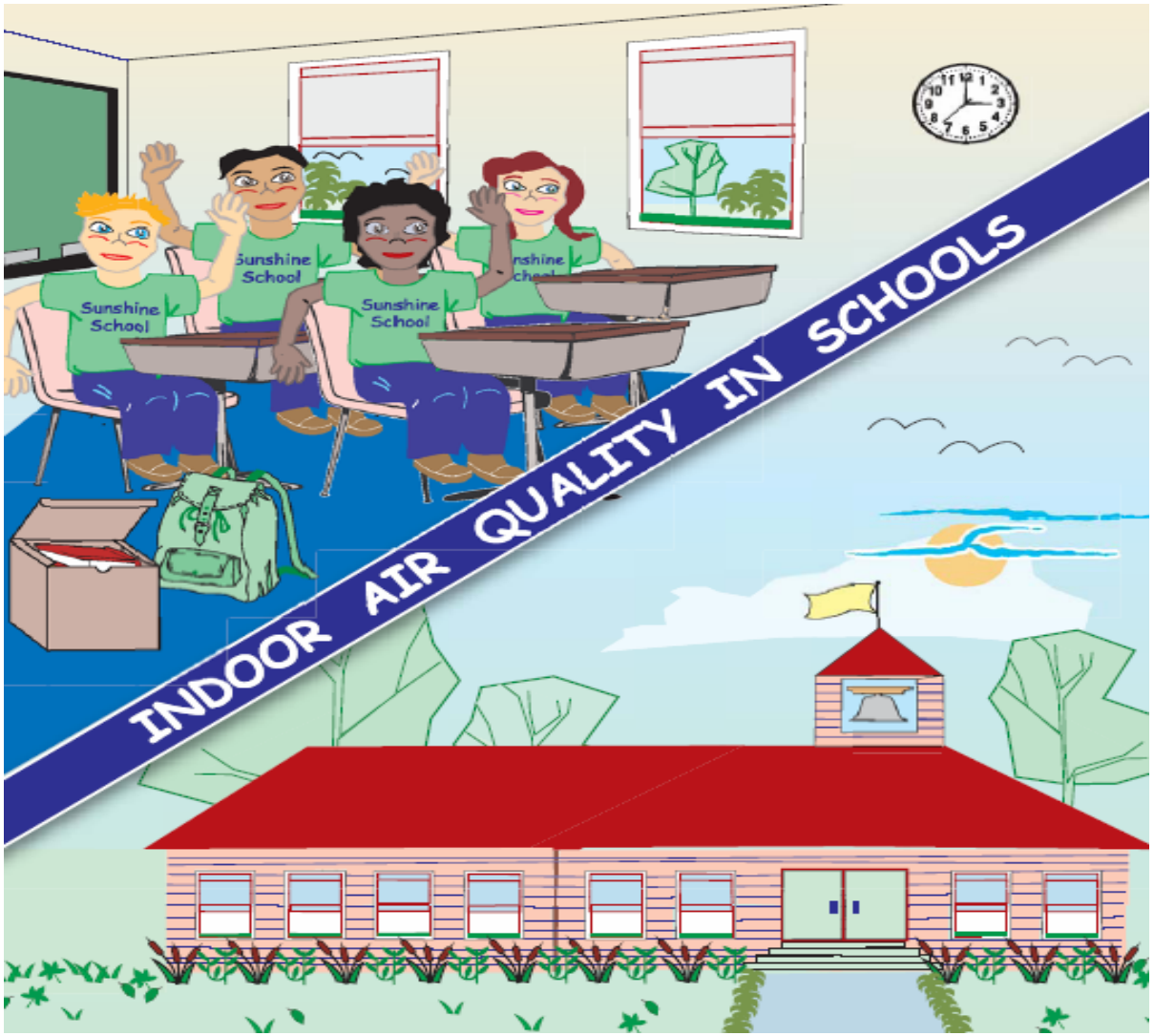
Indoor Air Quality (IAQ) in Schools Comic Book



Supplemental Material: IAQ in Schools Comic Book
(accompanies IAQ Lesson 1 – Introduction and Overview to IAQ)

Indoor Air Quality (IAQ) in Schools Comic Book

The indoor or "built" environment is as fascinating and complex as the outdoor environment and since we spend 90% of our day indoors, it is truly the human environment. The quality of the air indoors is important to our health and productivity. Good indoor air quality (IAQ) in schools helps enable education employees to do their best work and for students to learn to the best of their abilities. The U.S. Environmental Protection Agency has created a voluntary and common sense program called IAQ Tools for Schools (IAQ TfS) to help schools improve IAQ and avoid situations which contribute to poor environmental conditions.

This illustrated comic book on IAQ in schools serves as a supplemental guide to the IAQ TfS Program and is designed to be used by students and teachers from elementary through high school. The text and artwork were kept simple so that (1) 4th-5th grade students would be able to read and understand it, and (2) because many of the principles and practices of IAQ are simple and best communicated to all ages with elementary illustrations. It is expected that elementary school teachers will work closely with their students to lead them through the guide and schools while middle and high school students will be able to work more independently.

Using this guide, students and teachers will be able to explore their schools and recognize architectural, mechanical, and maintenance procedures which can contribute to good or poor IAQ. Additionally, they will learn how occupant behavior and our typical activities can dramatically affect the quality of our air inside our buildings.

We encourage students and teachers with artistic or photographic ability to customize this guide to their own school. Using actual school building features and the typical activities of their school, students can create an "owners manual" for their indoor environment.

**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

Indoor Air Quality (IAQ) in Schools Comic Book

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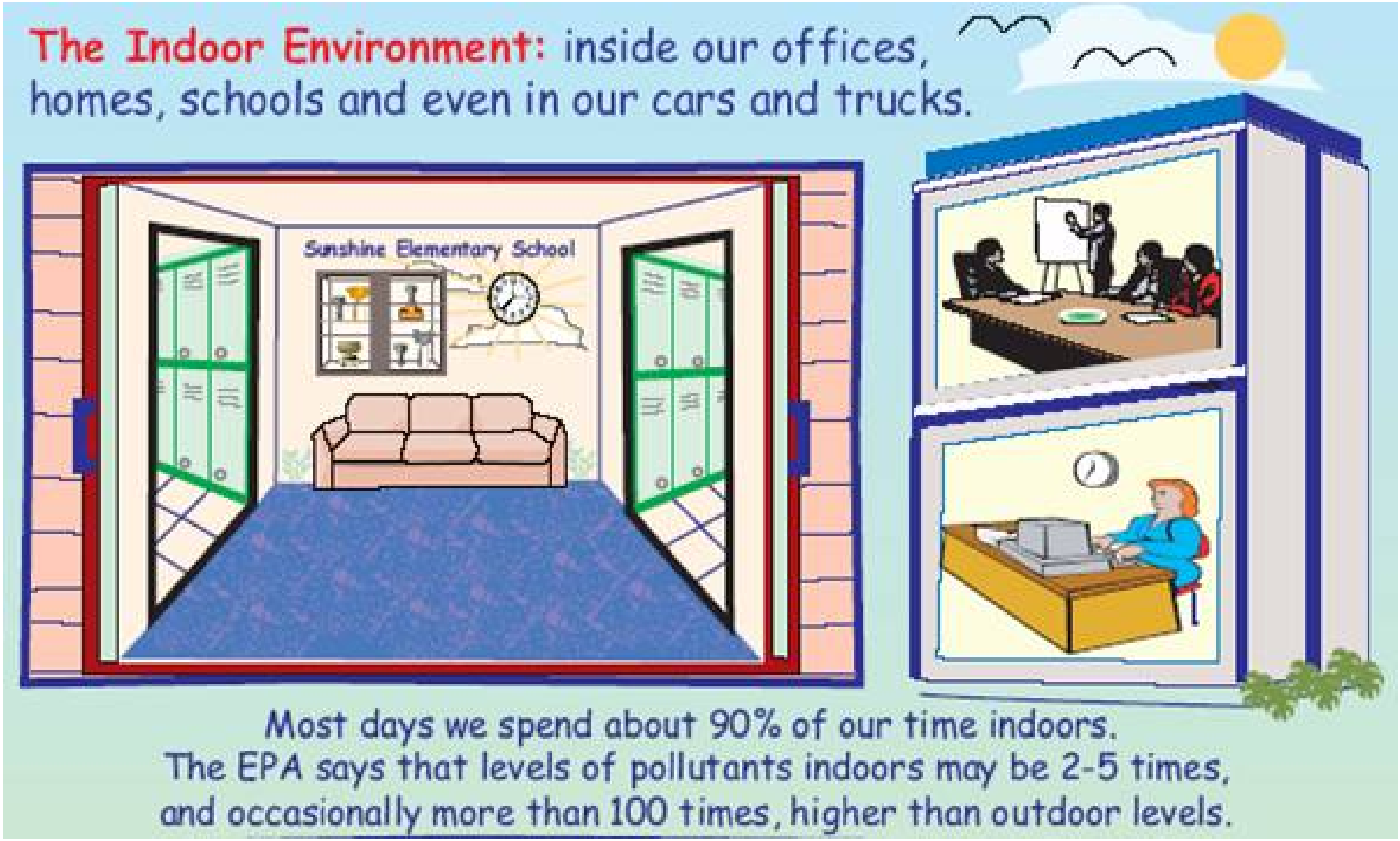

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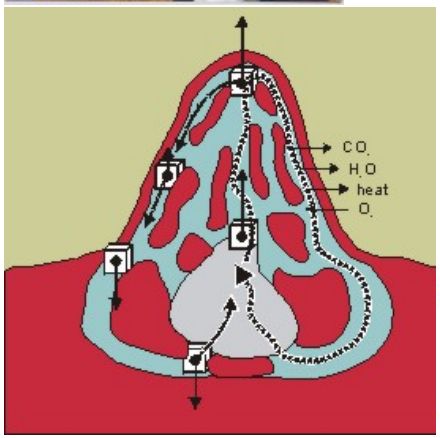
Indoor Air Quality (IAQ) in Schools Comic Book

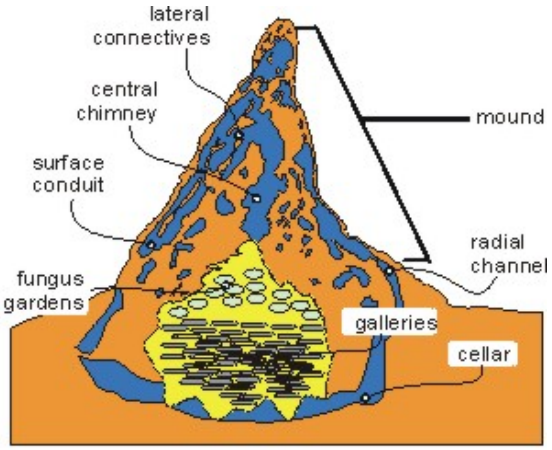
"Animals have been building homes for millions of years and they've "learned" how to build them to meet their needs. We're still experimenting – on ourselves!" Shelly Rosenblum

Dr. J. Scott Turner of the State University of New York.
http://www.esf.edu/efb/turner/termite/termhome.htm

Termite mounds are ventilation systems for the colony below ground.

Engineers took lessons from termite mounds when they designed the ventilation system for the Eastgate Complex in Zimbabwe.





***Photos are courtesy of Dr. Turners website http://www.esf.edu/efb/turner/Turner.htm**

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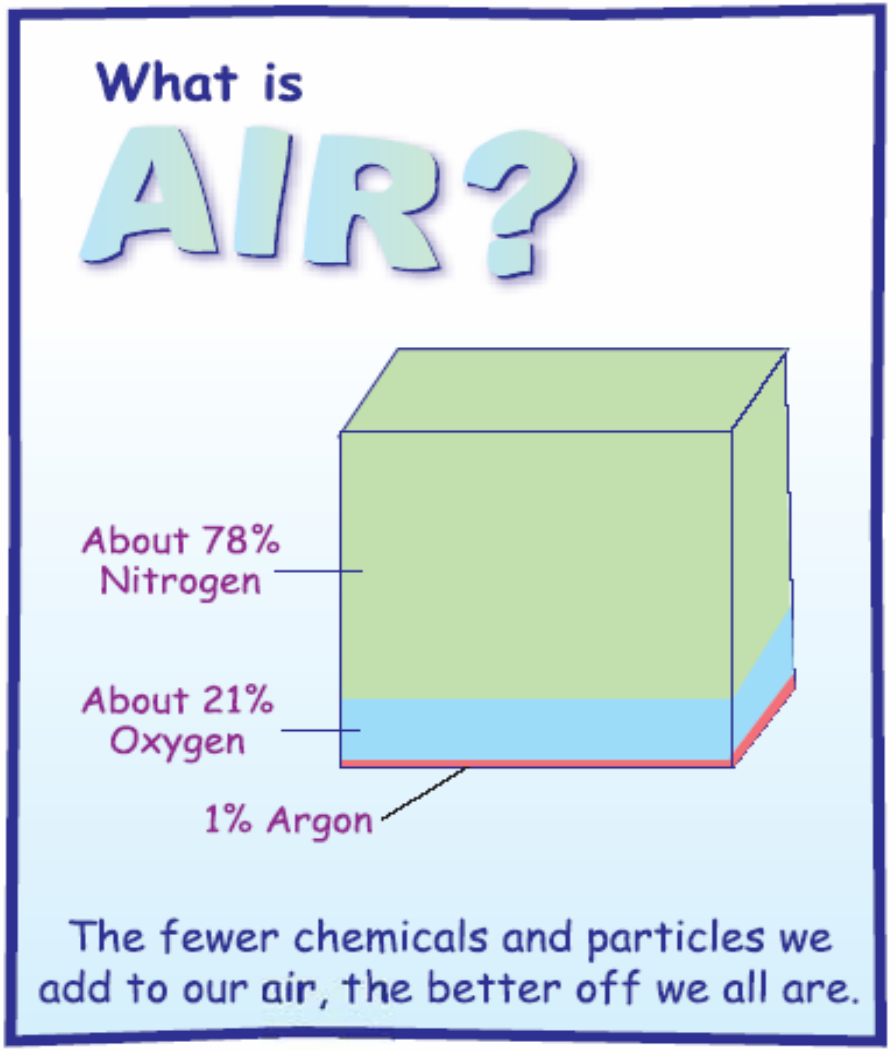

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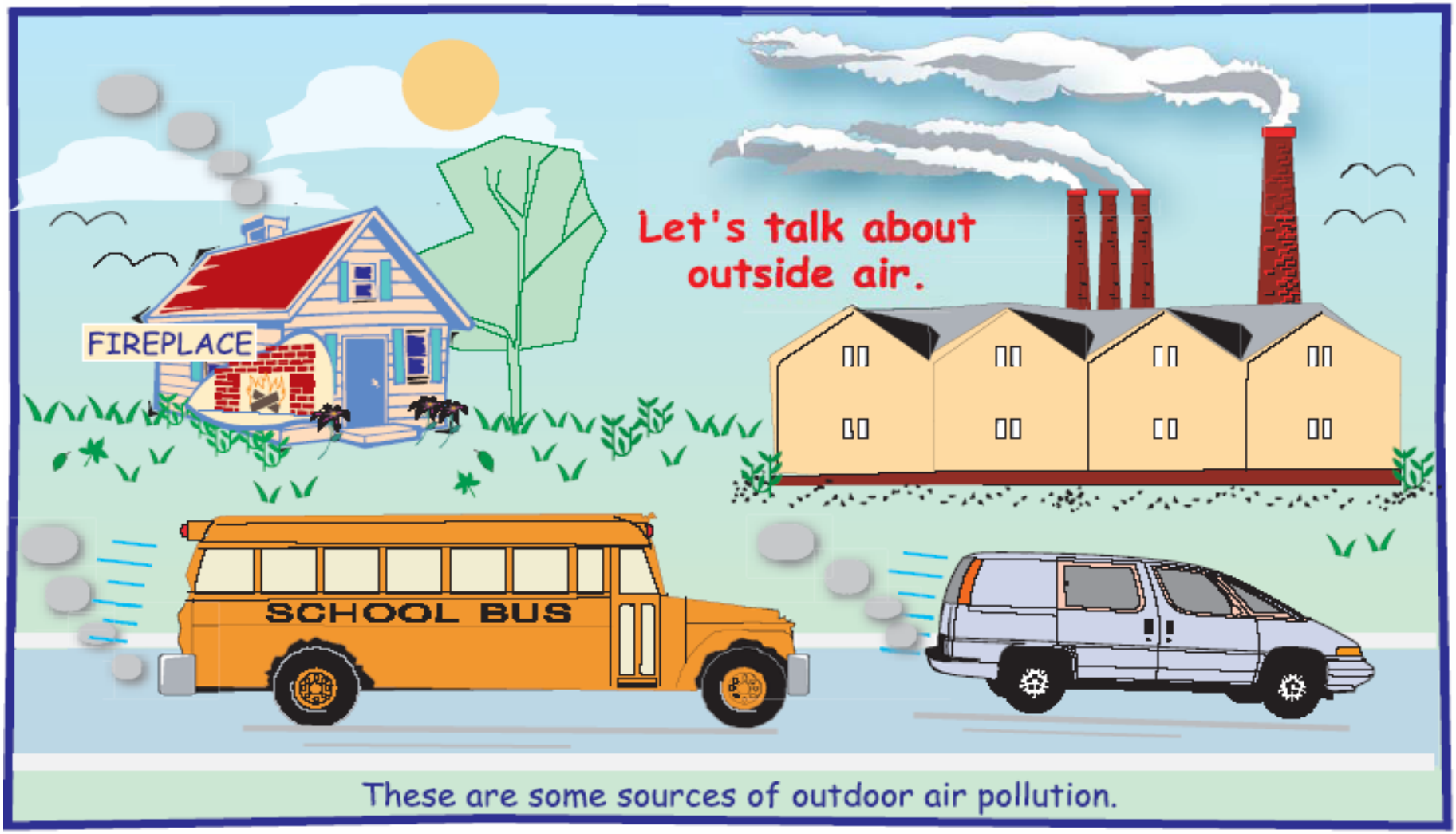

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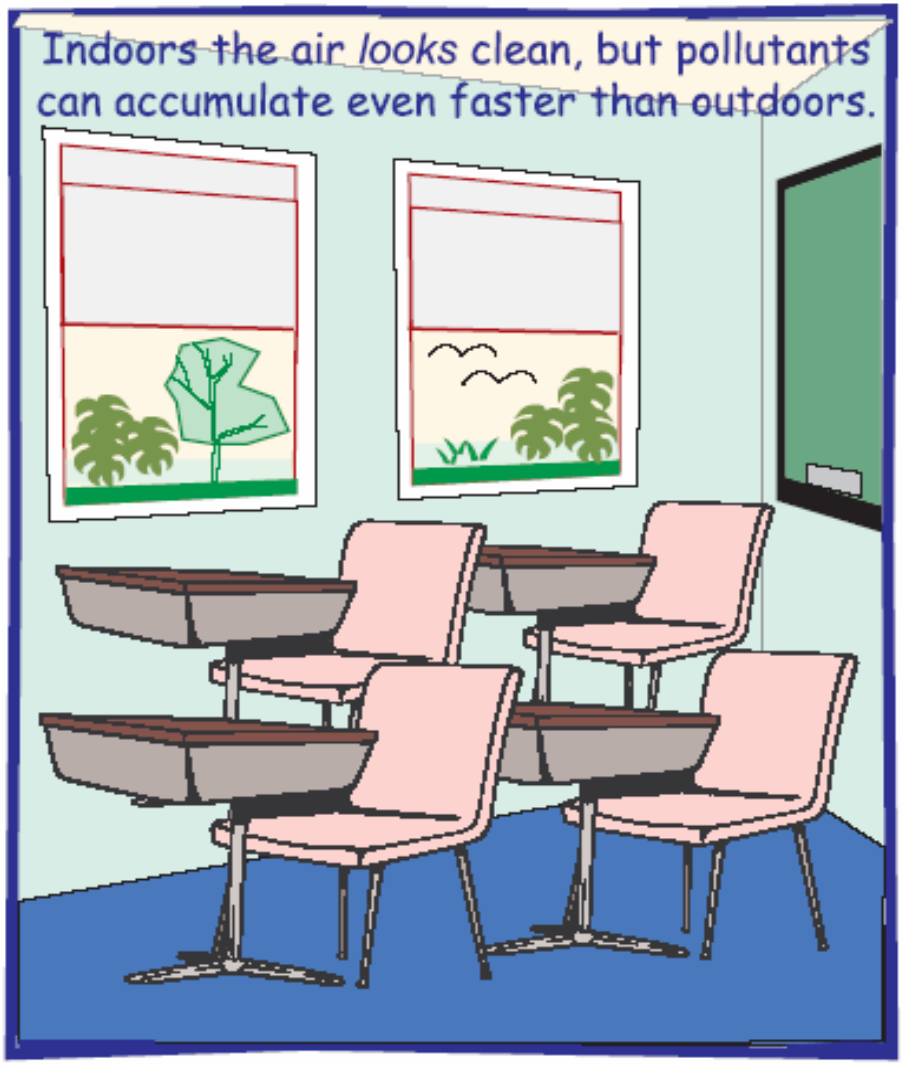

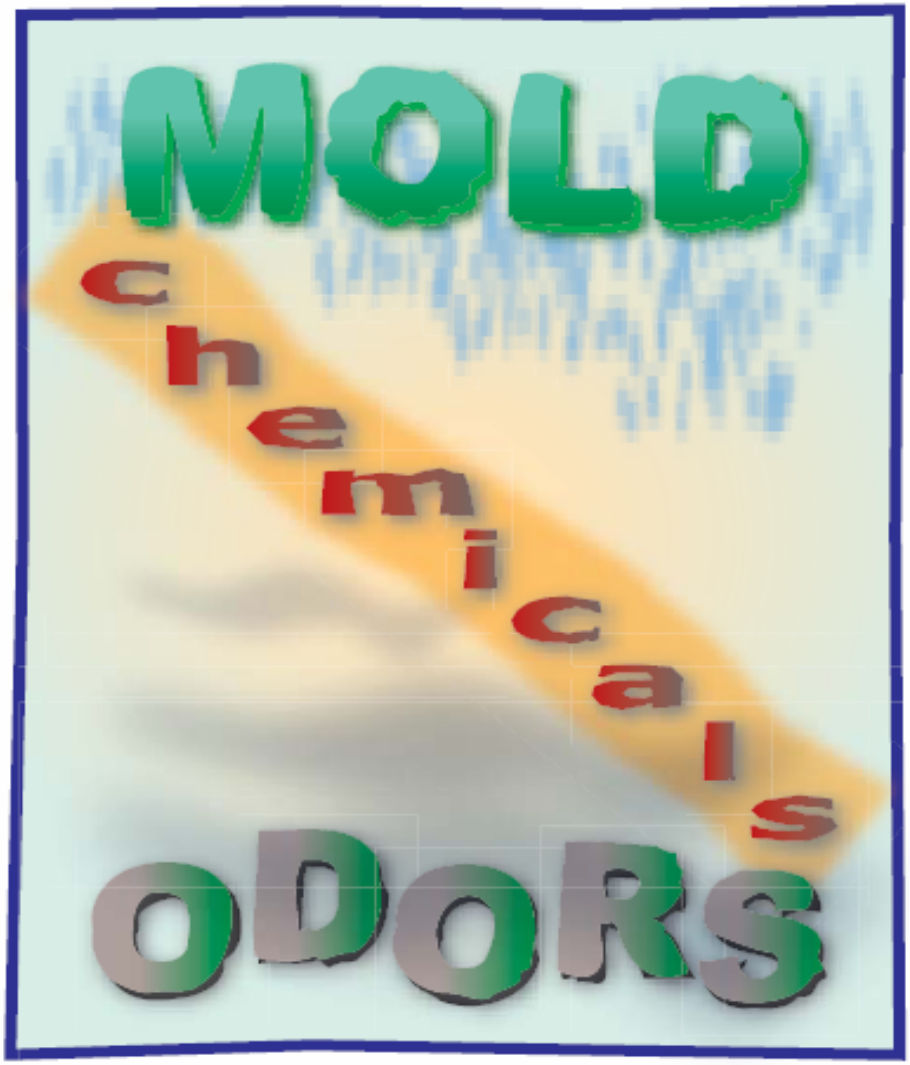

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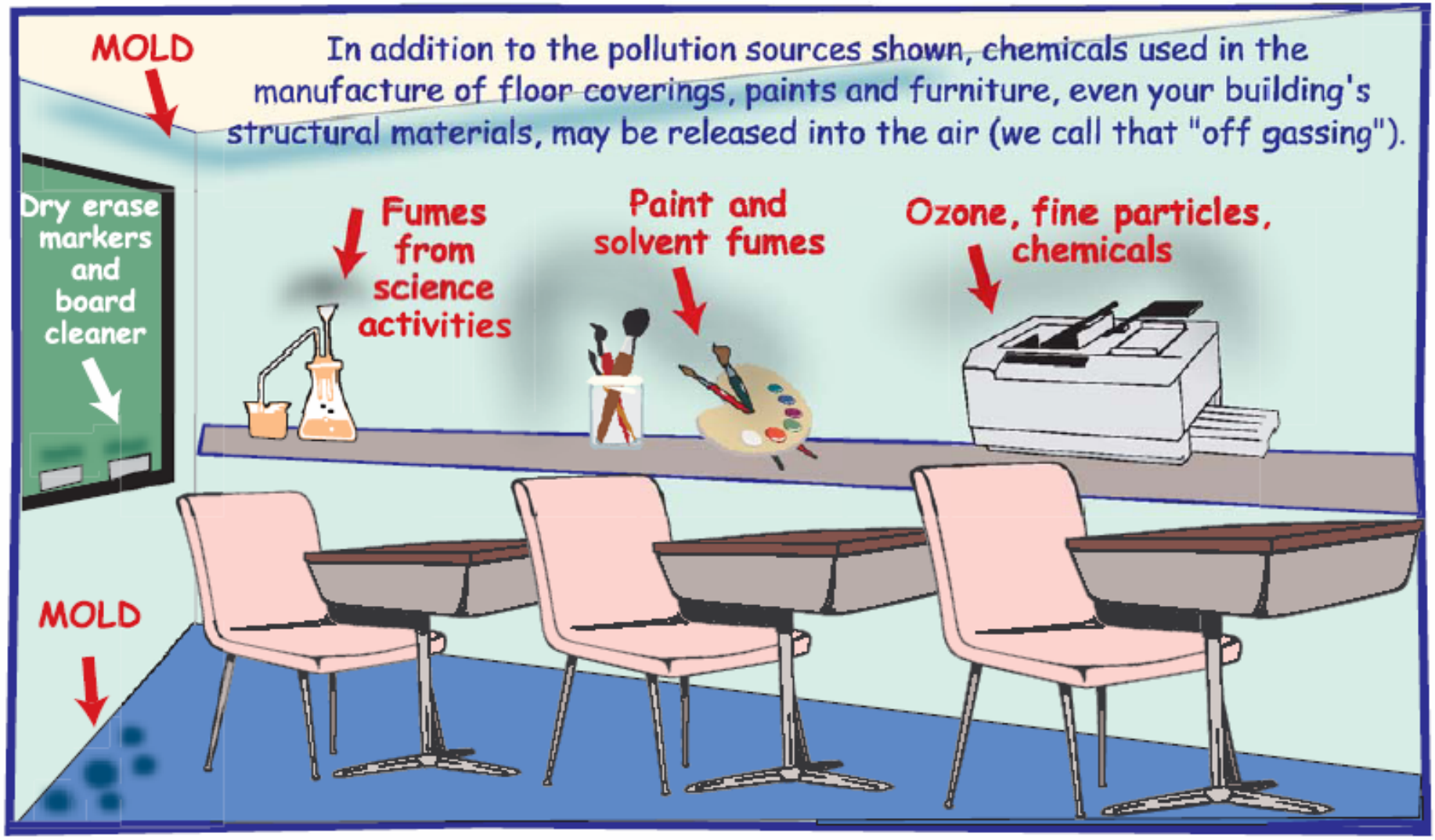

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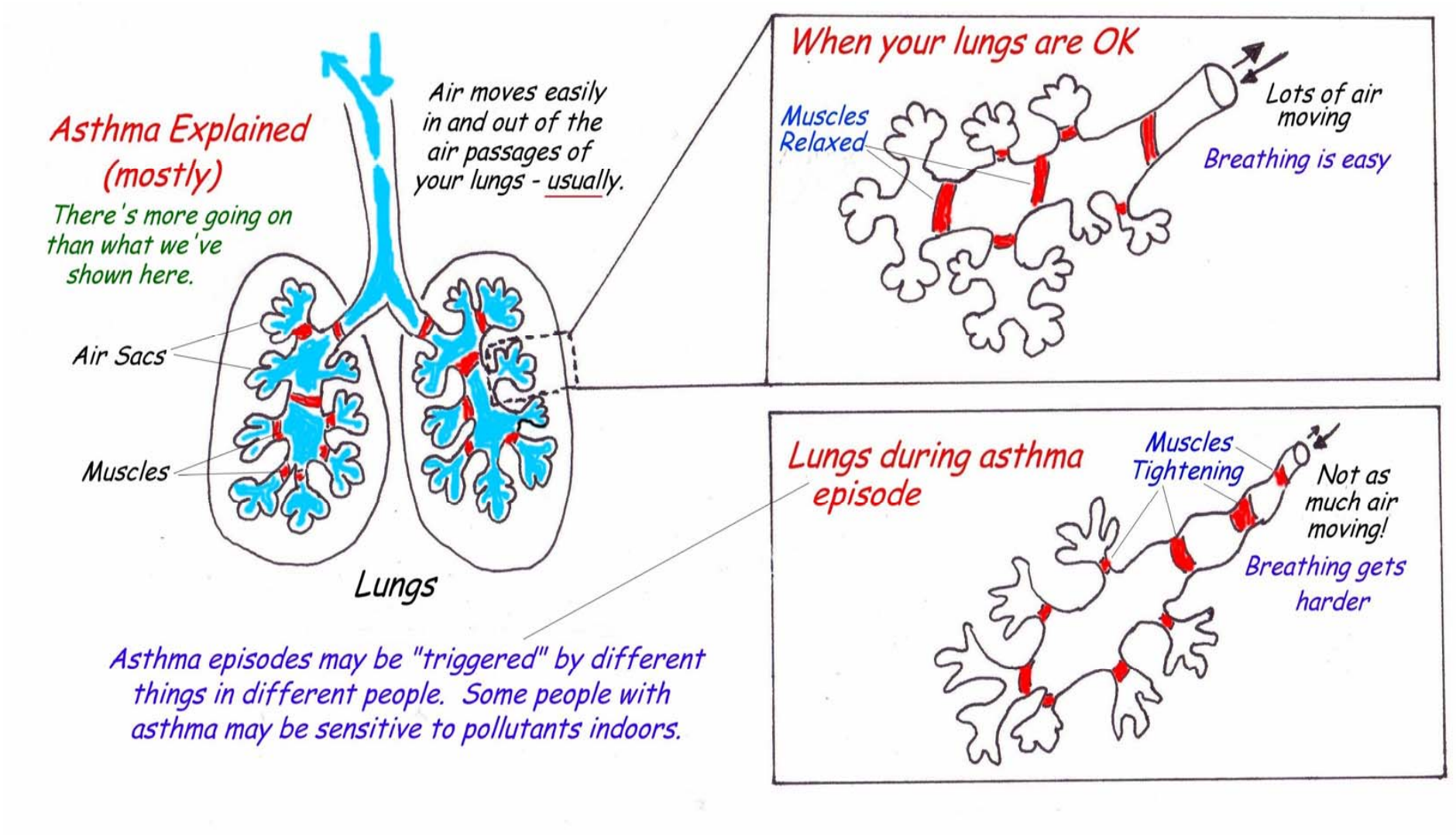
Indoor Air Quality (IAQ) in Schools Comic Book

Human beings and animals breathe in air containing oxygen (O_2) and breathe out air containing carbon dioxide (CO_2) and other contaminants. This is one of the ways our bodies have of getting rid of wastes. And we all know about unpleasant gases and odors from our digestive processes and perspiration! To make us smell better we use aftershaves, colognes, perfumes and deodorants. We also use hairsprays, nail polish and other personal care products. These products may add additional contaminants to the air. It makes sense not to breathe too much of these contaminants which accumulate quickly in closed rooms. We should remove these odors and contaminants by opening windows or using good mechanical ventilation!

Indoor Air Quality (IAQ) in Schools Comic Book

- Asthma leads to **2 million emergency room** visits and **5,000 deaths** per year in the U.S.
- Asthma accounted for more than **14 million missed school** days in 2000.
- Asthma costs (health care costs and lost productivity) totaled **$14 billion** in 2002.

Indoor Air Quality (IAQ) in Schools Comic Book



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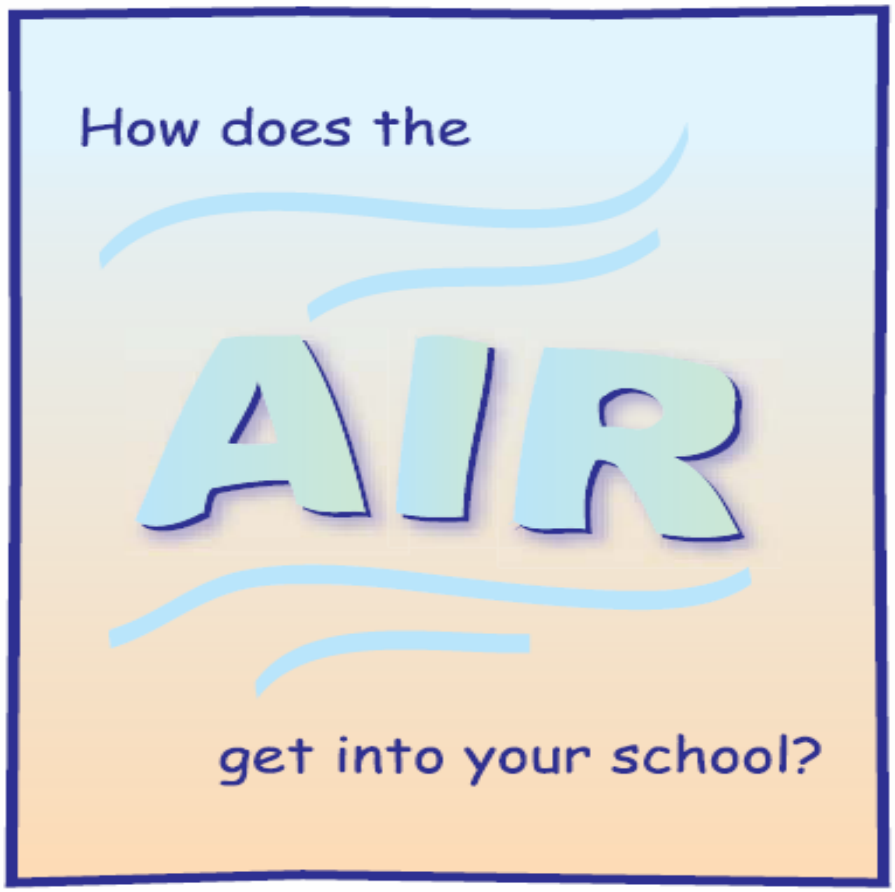
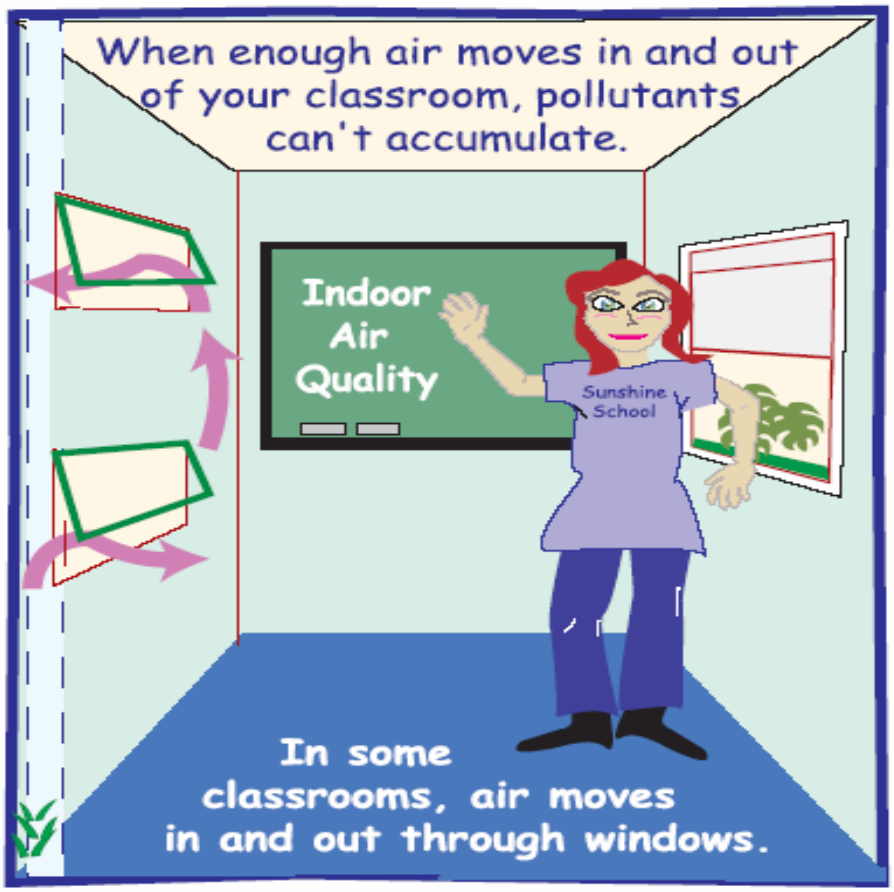
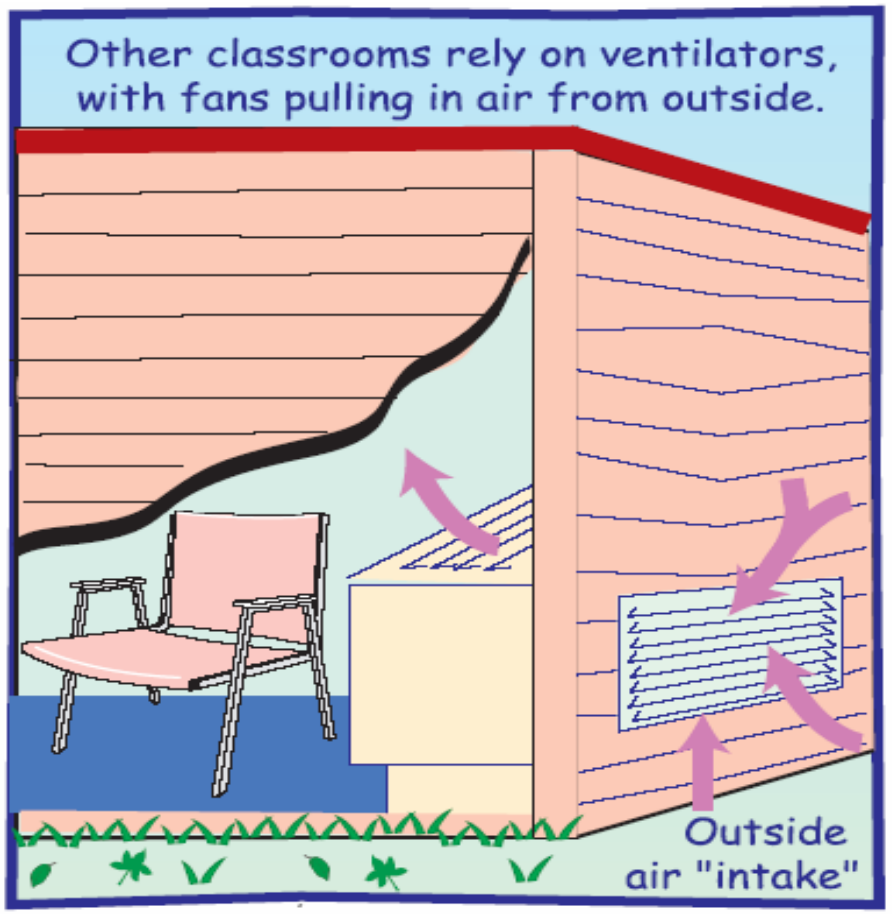
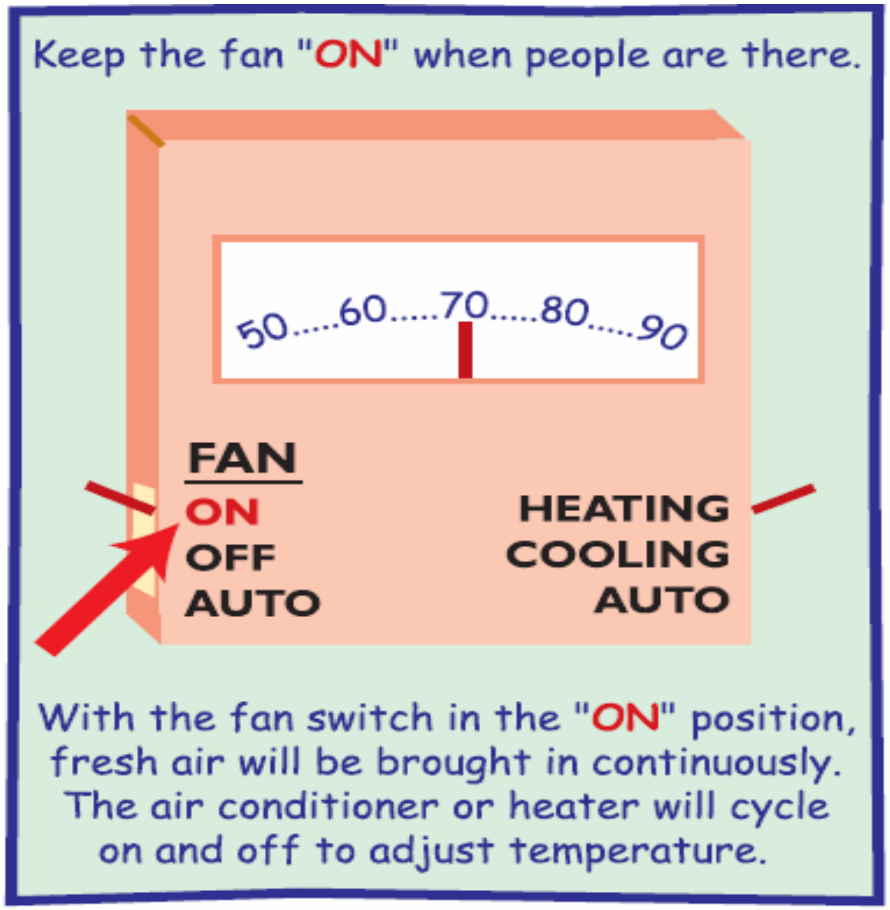




It's important to open both top and bottom windows since warm air is lighter than cool air. Warm air moves out of the top window and cool air comes in the bottom window. Closing either window prevents this natural circulation.

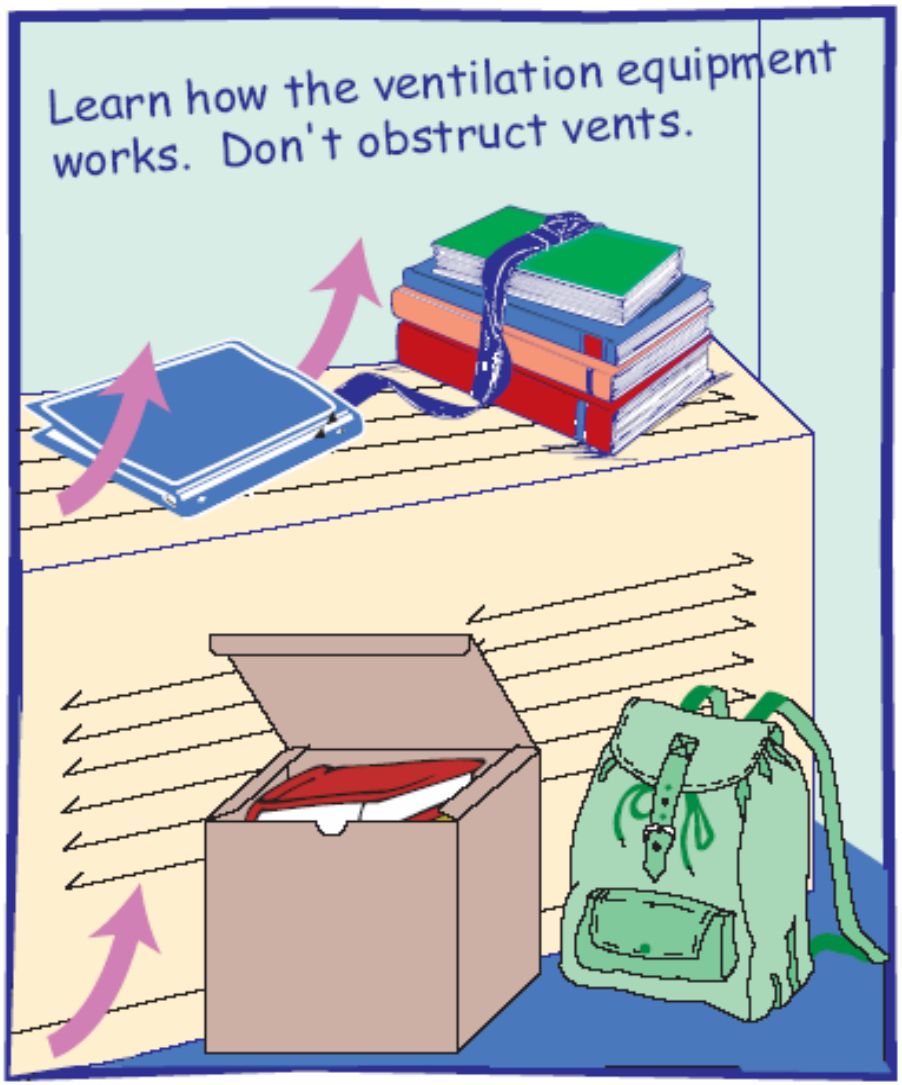
Indoor Air Quality (IAQ) in Schools Comic Book



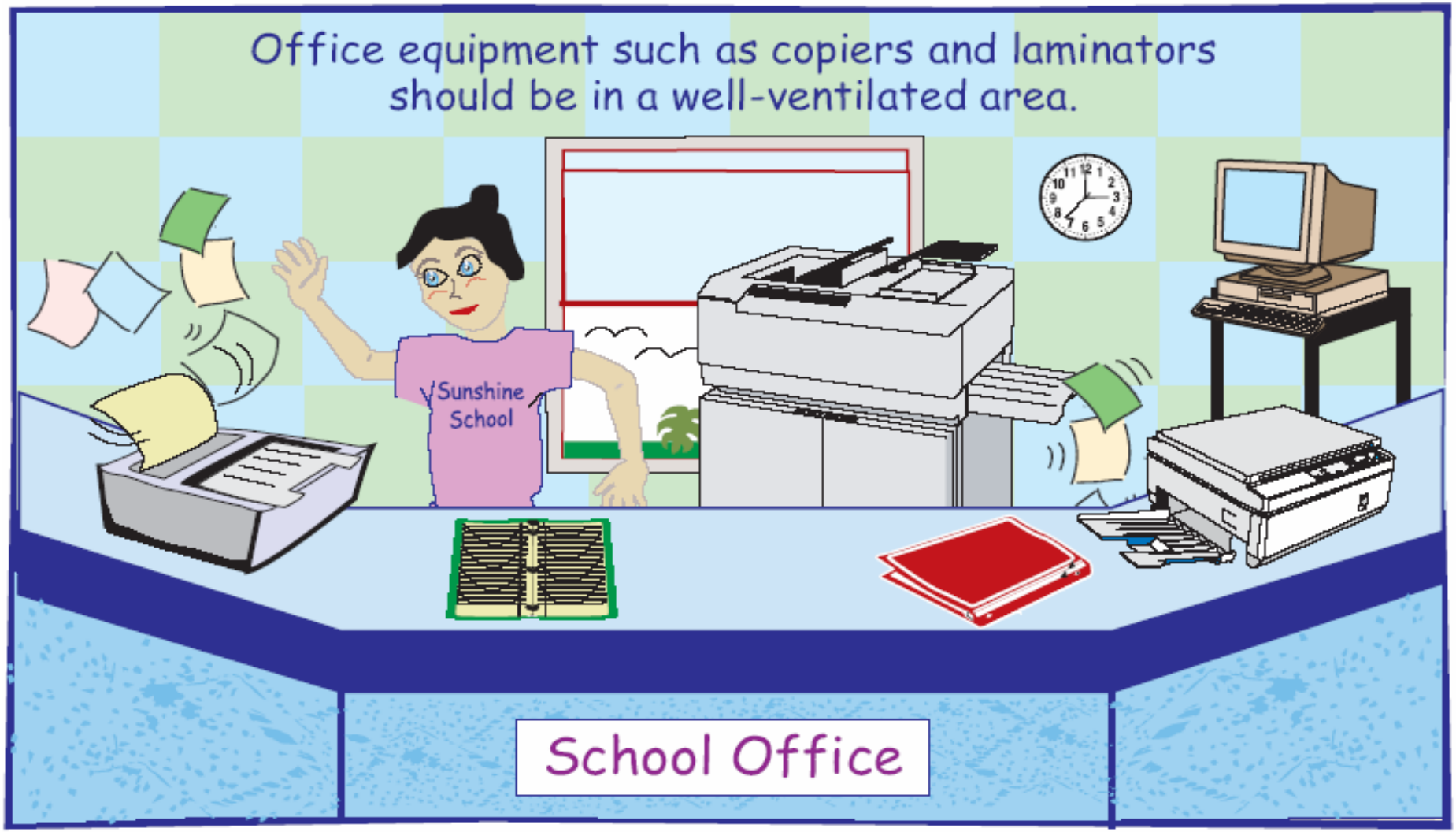


If you have ventilation controls like this in your room, cut out this diagram and place it near the controls to explain how they should be set.

Indoor Air Quality (IAQ) in Schools Comic Book



Indoor Air Quality (IAQ) in Schools Comic Book



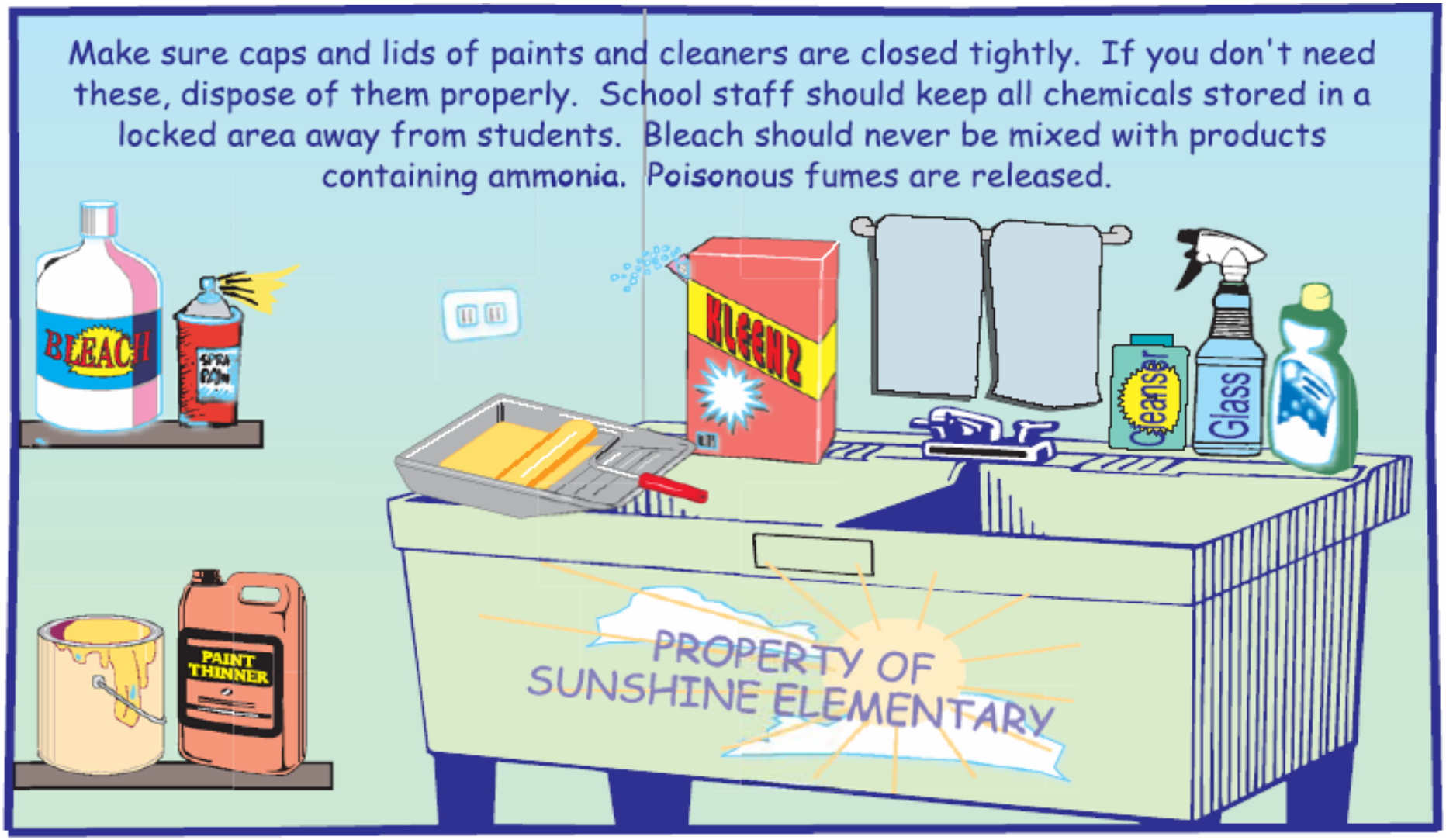
Supplemental Material: IAQ in Schools Comic Book
(accompanies IAQ Lesson 1 – Introduction and Overview to IAQ)
Created with assistance from the U.S. Environmental Protection Agency Region 9's Indoor Environment Team.

Indoor Air Quality (IAQ) in Schools Comic Book

Supplemental Material: IAQ in Schools Comic Book
(accompanies IAQ Lesson 1 – Introduction and Overview to IAQ)
Created with assistance from the U.S. Environmental Protection Agency Region 9's Indoor Environment Team.

Indoor Air Quality (IAQ) in Schools Comic Book

Indoor Air Quality (IAQ) in Schools Comic Book



Supplemental Material: IAQ in Schools Comic Book
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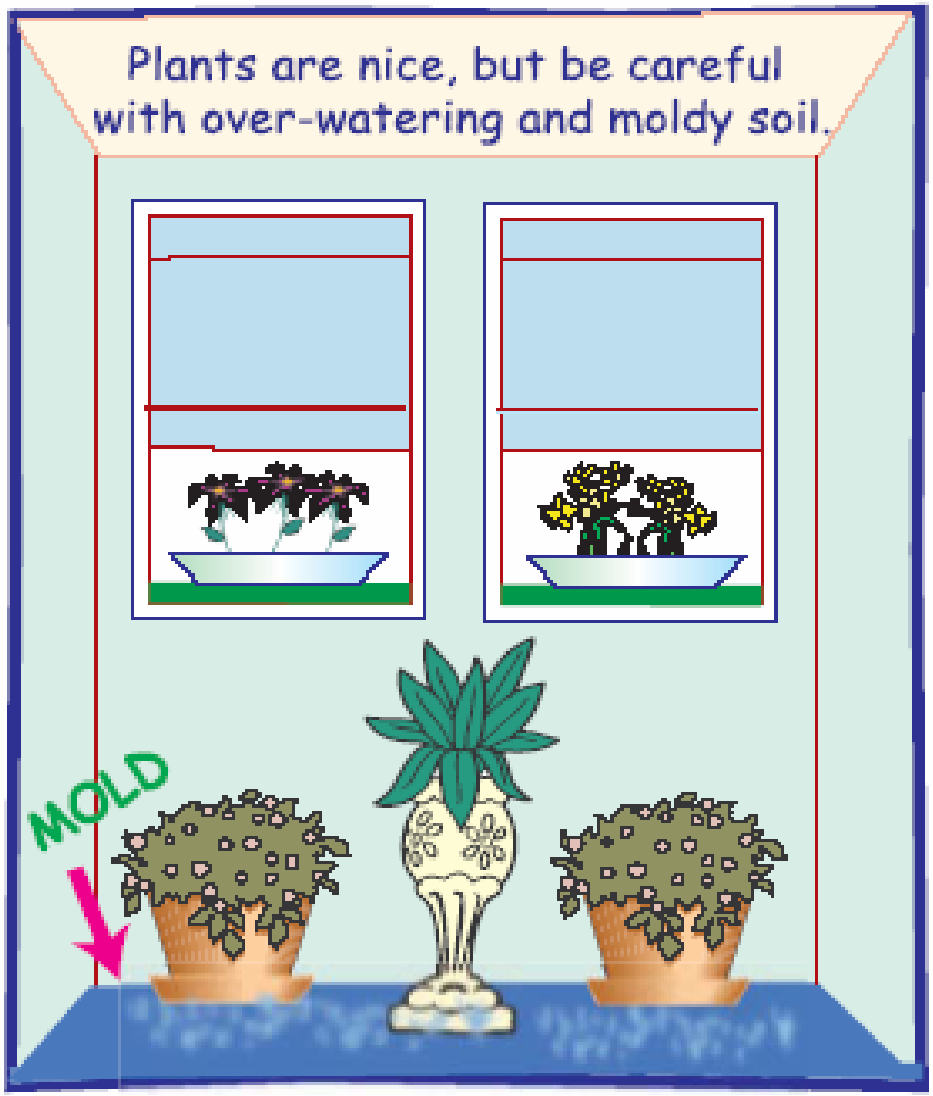
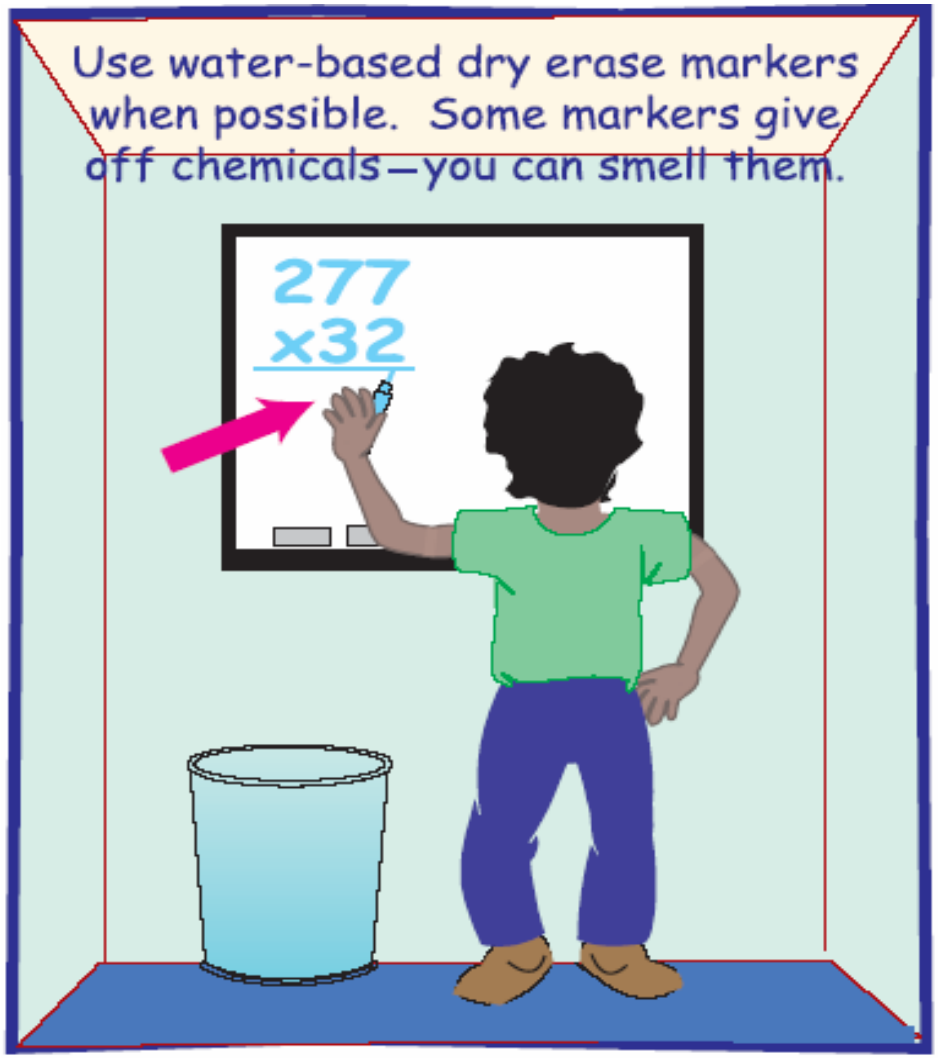
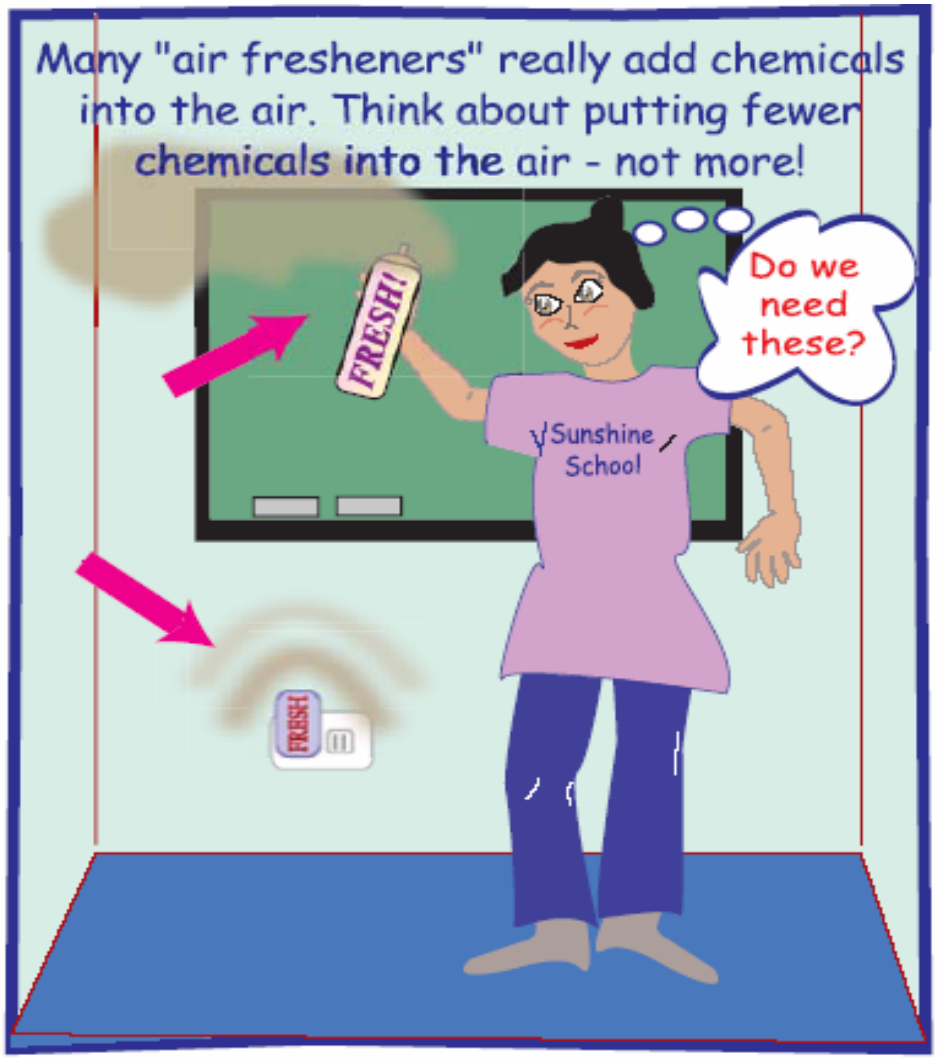
Indoor Air Quality (IAQ) in Schools Comic Book

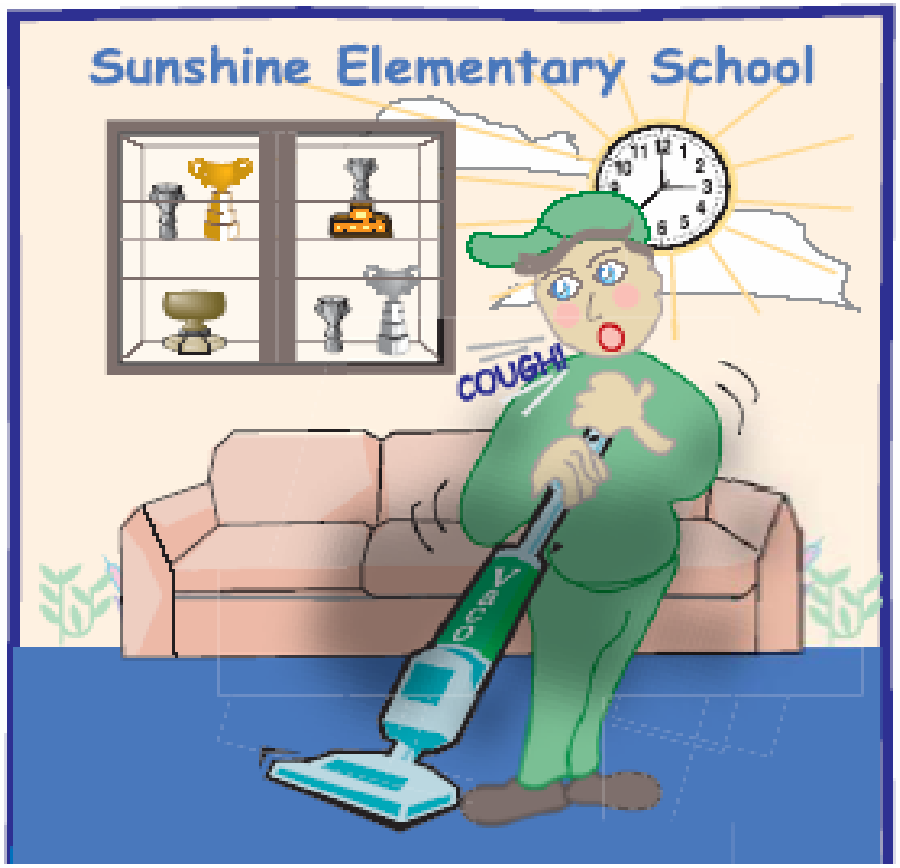


Indoor Air Quality (IAQ) in Schools Comic Book





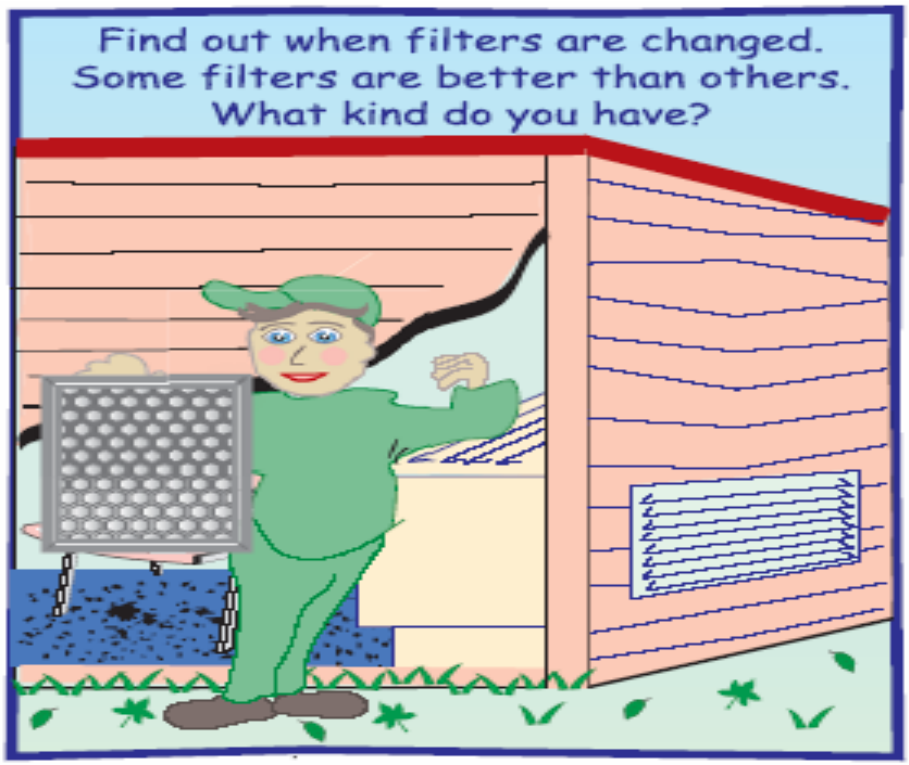
Indoor Air Quality (IAQ) in Schools Comic Book

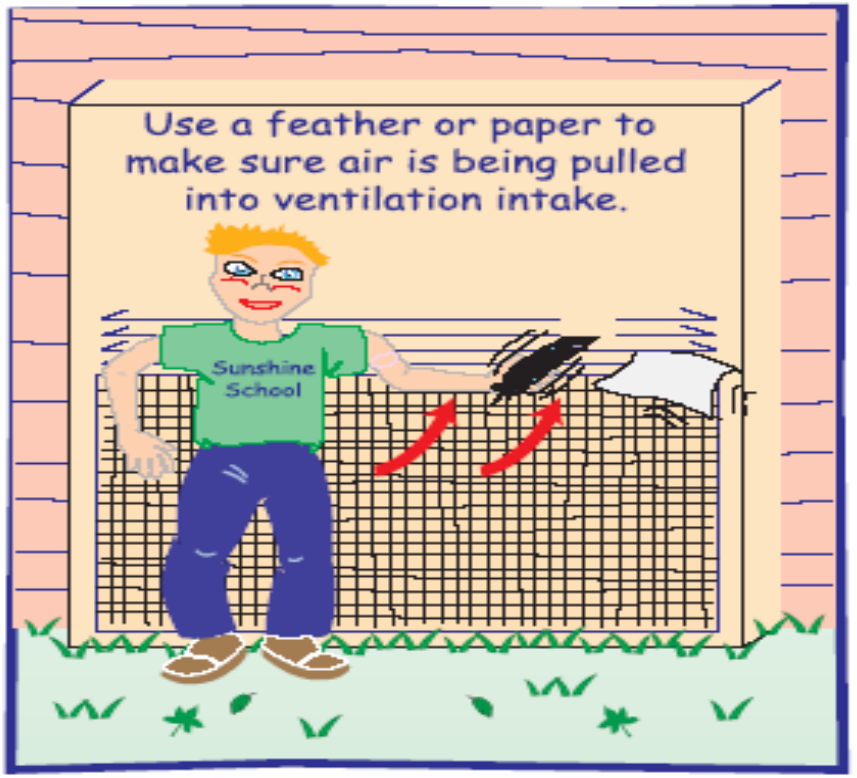


If the school's vacuum cleaner doesn't have a good filter bag, it's just putting dust back into the air.

Indoor Air Quality (IAQ) in Schools Comic Book

Indoor Air Quality (IAQ) in Schools Comic Book

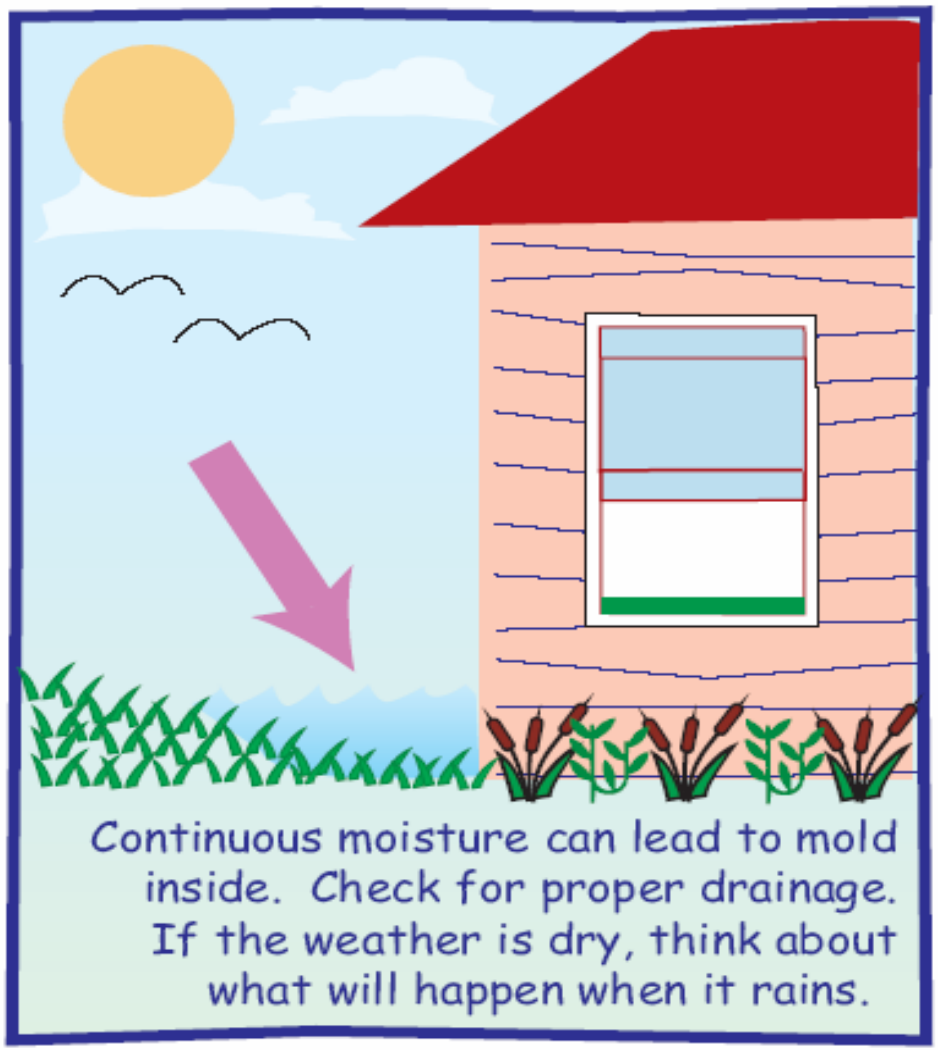


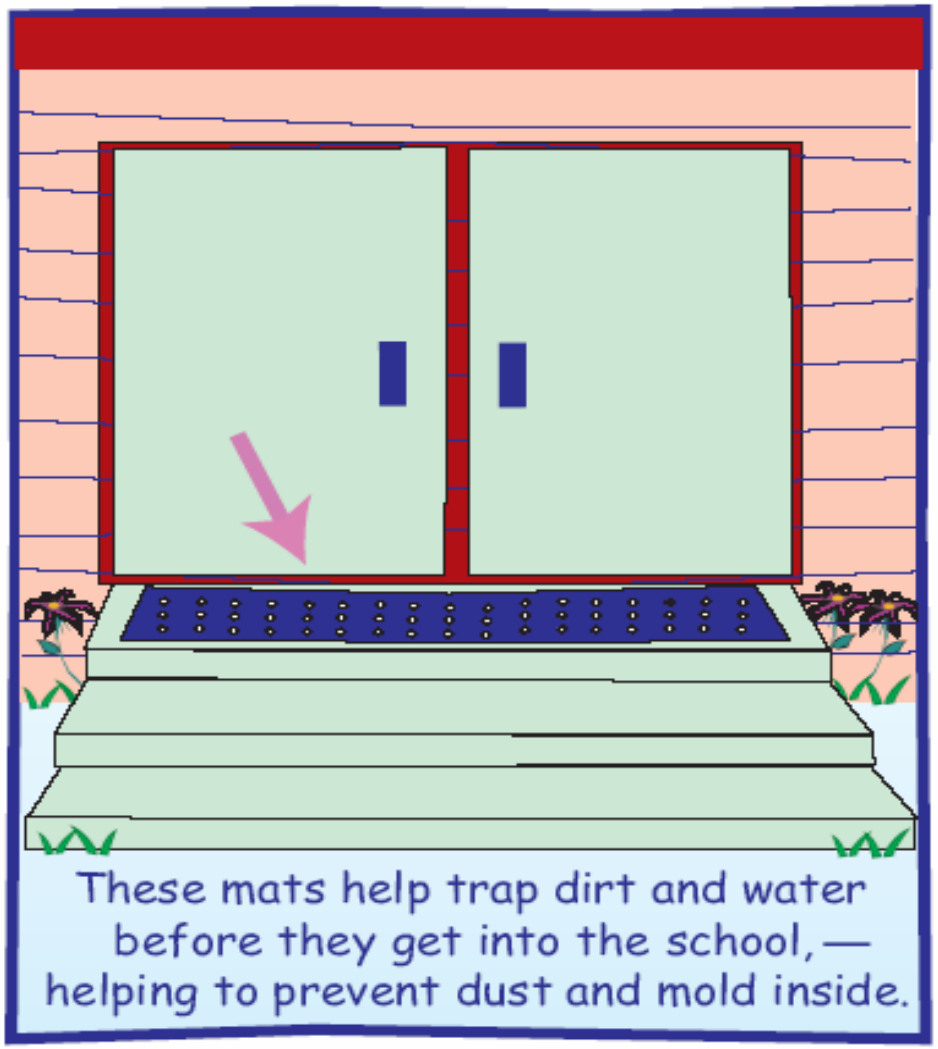


The American Society of Heating, Refrigeration & Air Conditioning Engineers (ASHRAE) recommends that ventilation systems supply 15 cubic feet of outside air per minute per person, constantly while the room is occupied. Many states have adopted this recommendation into their ventilation codes. It takes special equipment to measure air flow, but at least we can make sure that air is being drawn in.

Indoor Air Quality (IAQ) in Schools Comic Book

Indoor Air Quality (IAQ) in Schools Comic Book





Indoor Air Quality (IAQ) in Schools Comic Book

Indoor Air Quality (IAQ) in Schools Comic Book

Now use this guide to identify sources of indoor air contaminants and activities which lead to poor IAQ at your school.

Use your own drawings or photographs to create an "owner's manual" for your school.

The purpose of this lesson is to allow students to determine sources of indoor pollution.

TOPIC(S)					
√	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS	√	SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
√	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY

OBJECTIVE(S)

The students will be able to use the Internet for research. The students will be able to demonstrate an understanding of the connection between indoor air pollution and its effects on occupant health.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry

- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives

- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND

4-5, 6-12 science

ESTIMATED TIME LENGTH

2 class periods

LESSON PROCEDURES

In this activity students will investigate different types of flooring and recommend one with the least negative effect on the indoor environment.

PREPARATION

Students will need Internet access.

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

BRAINSTORM
During a class discussion, brainstorm a list of the various types of flooring that can be used.

RESEARCH
Have students select a partner. Have students copy the list of flooring materials that the class generates onto the **Floor Covering Investigation Graphic Organizer** (see Materials section). Provide additional copies as necessary. Have students work together to complete the graphic organizer by using the computer to conduct the necessary research (see Resource section for recommended websites).

SHARING THE INFORMATION (Carousel Brainstorming)
Write the name of each type of flooring on a piece of chart paper. Post the charts around the room. Assign each set of partners to a chart. Depending on the size of your class, you may have more than one pair at each chart. Students will need to take a marker with them to the chart. Once at their assigned chart, ask students to summarize the important information from their graphic organizer by listing it on the chart. Give the students five minutes at the first chart. After five minutes, signal the students to rotate to the next poster. Give them two minutes at the next poster to read what was previously written and place checkmarks next to any statements they agree with (based on their own research). Give them two additional minutes to add any new information (adjust time as needed). Signal the students again and continue to rotate clockwise until all groups have gotten a chance to go to each poster.

MAKING THE RECCOMENDATION
After all of the information has been added to each poster, have the students take a "Gallery Walk" to look at all of the charts. They need to be able to see the charts continuously. Based on the information on the charts, ask students to independently write a mock letter to the principal recommending the type of flooring they feel is best and why.

MATERIALS
Floor Covering Investigation Graphic Organizer (see IAQ Lesson 2 Supplement_Floor Covering Investigation Graphic Organizer.doc) markers, chart paper, computers with Internet access

GROUPING
whole class, small group, independent

ASSESSMENT

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Teacher can observe for active participation during the class discussion. Teacher can evaluate each student's graphic organizer. Teacher can evaluate writing sample.

MODIFICATIONS/EXTENSIONS

Students can use a similar advanced organizer and charting structure to research other aspects of IAQ.

Short on time? Since time is so precious, if you are not able to implement this entire lesson, try these activities:

- *Assign each student a type of flooring material to investigate on the Internet. Have them meet with a small group to discuss the findings*

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators 3-5

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

5: Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
7: Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)
8: Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
9: Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)

- Performance Indicators 6-8
  5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)
  7: Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)
  8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
  10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)

- Performance Indicators (9-12)
  7: Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)
  8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
  10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, Section 2, Pages 3-8 and Appendix E, Pages 33-37, Appendix H, Pages 45-48
- http://www.carpet-rug.com/

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Floor Covering Investigation
GRAPHIC ORGANIZER

NAME OF FLOORING MATERIAL (PLEASE COPY FROM CLASS LIST)	COMPOSITION (WHAT IS IT MADE OF?)	DURABILITY (WILL IT HOLD UP?)	COST	IAQ CONCERNS	EDUCATIONAL IMPACTS (COMFORT, ACOUSTICS, ETC.)

Your Name _____ **Date** _____

Supplemental Material: Floor Covering Investigation Graphic Organizer
(accompanies IAQ Lesson 2 – Floor Covering Investigation)
Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

The purpose of this lesson is to encourage students to prevent indoor environment problems by promoting public awareness.

TOPIC(S)					
√	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
√	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS	√	SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY

OBJECTIVE(S)

The students will be able to create a billboard design educating building occupants on at least one indoor air quality (IAQ) problem.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry

- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives

- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL) Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND

6-12 science, health, or language arts

ESTIMATED TIME LENGTH

1 – 2 class periods

LESSON PROCEDURES

PHASE 1 – ACTIVATE PRIOR KNOWLEDGE/CLASS DISCUSSION

Display photographs of billboards or samples of public service announcements (PSAs) from magazines (such as "Got Milk" advertisements). Explain to students that a billboard is one type of PSA. Discuss that all billboards advertise something (some are commercial, some are for the benefit of the public, and some are a combination of

both). Ask students to name types of billboards they have seen. Have students generate a list of the characteristics of *effective* billboards. Record the students' ideas on chart paper. Guide students' ideas in this discussion as necessary (use large print, not too much information, catchy slogan, etc.).

PHASE 2 – DESIGN BILLBOARDS

Tell students they will be designing IAQ billboards on poster board. They should choose an IAQ topic they feel the public needs to be informed of (such as radon, mold, asthma, or second hand smoke). Provide each student with a copy of the IAQ Backgrounder (see Materials Section) found in the EPA's *IAQ Tools for Schools* Action Kit. Have students silently read the handout and decide on the topic they would like to design their billboard around. Have students complete the **IAQ Billboard Proposal Form** (see Materials section) and turn it in to you for approval before beginning their billboard. On the **IAQ Billboard Proposal Form** the students will identify two topics. You can determine one they will use so multiple billboards on the same topics can be avoided.

PHASE 3 – CREATE AND SHARE BILLBOARDS

Pass back the proposals. Have students create the billboard. After they are finished, display the billboards in a location where they can be viewed by their classmates. Let the students take a "road trip" to see the billboards. Have them select one billboard (other than their own) that they really learned from or appreciated. Ask them to write a one paragraph essay about that billboard, explaining their selection.

MATERIALS

chart paper, markers, crayons, colored pencils, white poster board (one per student), poster paint, sample PSAs to display, IAQ Backgrounder from the EPA's IAQ Tools for Schools Action Kit (one per student), **IAQ Billboard Proposal Form**—one per student (see IAQ Lesson 3 Supplement_IAQ Billboard Proposal Form.doc).

**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

GROUPING

whole class, independent

ASSESSMENT

Teacher can observe for active participation during the class discussion. Teacher can evaluate each billboard to check for understanding of the IAQ topic. Teacher can evaluate writing sample.

MODIFICATIONS/EXTENSIONS

Have students work in teams or with partners to create the billboard. Assign students billboard topics to research and create instead of allowing them to choose their own. Display the billboards around the school. Display the billboards at several local businesses for the benefit of community members. Develop awards for the billboards (such as most creative design or most informative). Have students vote for the billboard award winners. To integrate technology, have students create the billboard design using graphic arts software on the computer.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? */*What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators 3-5
  5: Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
  6: Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
  8: Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
- Performance Indicators 6-8
  5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3 ,6)
  6: Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
  8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
  10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)
- Performance Indicators (9-12)
  7: Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)
  8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
  10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, Section 4-6, Pages 13 - 20

IAQ BILLBOARD PROPOSAL FORM

TOPIC CHOICE 1

_____

What are the most important aspects of this problem?

TOPIC CHOICE 2

_____

What are the most important aspects of this problem?

Supplemental Material: IAQ Billboard Proposal Form
(accompanies IAQ Lesson 3 - Creating Public Awareness)
Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Using the Problem Solving Wheel

The purpose of this lesson is to provide students with an opportunity to solve problems utilizing the *IAQ Tools for Schools* Action Kit Problem Solving Wheel.

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS	√	SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
√	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS	√	SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY

			COMPOSITION OF AIR		DEFINING THE INDOOR ENVIRONMENT

OBJECTIVE(S)
The students will be able to use EPA's *IAQ Tools for Schools* Action Kit Problem Solving Wheel.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
6-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
The lesson is designed to be used with the EPA's IAQ Tools for Schools Action Kit*. You must have the Problem Solving Wheel (see Materials section) to implement this lesson.*

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

1. Activate the prior knowledge during a brief discussion about indoor air pollution. Ask students if they know how to solve problems at the school related to indoor air quality (IAQ)?
2. Tell the students that they will be given an opportunity to solve hypothetical problems. Put the students into five groups. Give each group a scenario from the **Problem Solving Wheel Scenarios** (see Materials section) and each student a Problem Solving Wheel (see Materials section).
3. Explain how to use the Problem Solving Wheel. Have students use the wheel to solve the problems on the scenario cards. Ask the students to use chart paper and markers to record the solutions they identify.
4. When the groups are finished, have each group share their scenario and solutions. After each group has a turn, ask the students to write a paragraph summarizing what they have learned.

MATERIALS

markers, chart paper, masking tape, **Problem Solving Wheel Scenarios** (see IAQ Lesson 4 Supplement_Problem Solving Wheel Scenarios.doc), Problem Solving Wheel from the EPA's IAQ Tools for Schools Action Kit (one per student).

** To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit and/or Problem Solving Wheel tool contact IAQ INFO at 800-438-4318 or visit www.epa.gov/iaq.*

GROUPING

whole class, small group, independent

ASSESSMENT

Teacher can observe students for active participation problem solving. Teacher can assess the students' solutions. Teacher can evaluate writing sample.

MODIFICATIONS/EXTENSIONS

Have groups rotate cards to have an opportunity to solve all scenarios. Compare solutions.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition)

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

PROBLEM SOLVING WHEEL SCENARIOS

Scenario #1

You smell an unusual odor in your classroom. There is no moisture, dampness, or mold. There are no pets or pests in the classroom. The room has not recently been cleaned and there are no cleaning products in the room.

What could the source of the odor be?
What steps could you take to determine the causes?
What information do you still need/questions do you have?
Is there any chance this could be an emergency situation? If so, what should be done?

Scenario #2

It is a dark and dreary day and you are in your classroom taking a test. You begin to feel very warm. The teacher stops the test because other students have complained of this discomfort as well. There is no odor. You can not check on the thermostat setting because the controls are not located within your classroom. You place your hand beside the vent and you can not feel any air coming out.

What could the problem be?
What information do you still need/questions do you have?
What steps should be taken to solve the problem?
Is there any chance this could be an emergency situation? If so, what should be done?

Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

PROBLEM SOLVING WHEEL SCENARIOS

Scenario #3

You develop a headache in the art room. It is the end of the class period and you and your classmates have just finished freehand drawing projects. There are a few classmates at your table who also have headaches. You are sitting in the back of the room near the sink. You can not identify any particular odor, the art room always smells strange because of all of the materials used for the projects. There are no pets or visible pests in the classroom. There are no signs of any mold in the classroom. When looking around the room you notice a schedule of the art classes and activities posted on the board. The class before you, according to the schedule, is Abstract Painting.

What could the problem be?
What information do you still need/questions do you have?
What steps should be taken to solve the problem?
Is there any chance this could be an emergency situation? If so, what should be done?

Scenario #4

You are talking with some of your friends after school and discover that recently several of you have been infected with bronchitis. A few in the group have had bronchitis several times in the last few months. No one in the group has classes together but you are all on the school newspaper committee that meets in the library. One student remembers that the school library was closed after school about two months ago due to a leak in the ceiling following a bad rain storm.

Could the health problems among you and your friends be related?
What could be causing the reoccurring respiratory problems that you and your friends are experiencing?
What information do you still need/questions do you have?
What steps should be taken to solve the problem?
Is there any chance this could be an emergency situation? If so, what should be done?

Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

PROBLEM SOLVING WHEEL SCENARIOS

Scenario #5

You have been having very itchy and watery eyes at school. Some times during the day are worse than others. It goes away when you are at home and you do not suffer from allergies. You don't wear contacts. You do not have any other symptoms of a health problem such as a cold or flu. New carpeting was recently installed in a wing of your school.

What could the problem be?
What information do you still need/questions do you have?
What steps should be taken to solve the problem?
Is there any chance this could be an emergency situation? If so, what should be done?

Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Ventilation Basics Video Inquiry

The purpose of this lesson is to teach students how ventilation systems are used to provide quality air in the indoor environment.

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS	√	SOURCES OF INDOOR AIR POLLUTION	√	MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY

OBJECTIVE(S)
The student will be able to identify key information from a video resource using an advanced organizer (bingo).

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
3-5, 6-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES

The lesson is designed to be used with the EPA's IAQ Tools for Schools Action Kit. You must have the IAQ TfS Taking Action & Ventilation Basics Video (see Materials section) to implement this lesson.

1. Distribute **Ventilation Video Bingo Cards** (see Materials section) to students, direct them to cut and paste slips to make their card.
2. Have students work in small groups to familiarize themselves with questions on the bingo card.
3. Introduce and show *IAQ TfS Taking Action & Ventilation Basics Video* (15 min.) Ask the students to complete the bingo card during the video. Try to get a coverall bingo.
4. After the video have a class discussion and ask students share their answers.

*If you choose, give prizes to bingo winners with correct answers. Offer different prizes for the first person that gets a traditional bingo, postage stamp bingo, picture frame bingo, and leading up to the grand prize for coverall bingo.

MATERIALS

Ventilation Video Bingo Cards—one per student (see IAQ Lesson 5 Supplement_Ventilation Video Bingo Cards.doc), bingo markers, *IAQ TfS Taking Action & Ventilation Basics Video* from the EPA's IAQ Tools for Schools Action Kit, prizes (optional)

**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

GROUPING

whole class, small group, independent

ASSESSMENT

Collect and evaluate the bingo cards for accuracy.

MODIFICATIONS/EXTENSIONS

Have students make predictions about the answers to the questions on the bingo card before watching the video. Invite a maintenance/HVAC technician or custodian to the classroom to talk to the students.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

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- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition)

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

To request a free copy of EPA's *Indoor Air Quality Tools for Schools* (IAQ TfS) Action Kit contact IAQ INFO at 800-438-4318 or visit www.epa.gov/iaq/schools/actionkit.html.

VENTILATION VIDEO BINGO CARDS

Cut out the Bingo Card squares. Glue the squares to the bingo card on the next page in any pattern that you choose.

How often should the filters be changed on a Unit Ventilator?	About 50% of ventilation systems in all schools are Unit Ventilators, what are the other half?	When using a Roof Top Unit for ventilation, when should the exhaust fans be running?	When using a Roof Top Unit why do you NOT want to have standing water by the cooling module?
What is IAQ (Indoor Air Quality)?	What is one of the considerations faced when using a Roof Top Unit?	How do you get rid of polluted air that is inside the building?	What percentage of time do we spend inside of the school?
When using a Unit Ventilator, what is the name of the equipment used to determine the volume of air flowing in or out of the classroom?	How often should the filters be changed on a Roof Top Unit?	How many more times polluted is the air inside than the air outside?	What are two things to pay attention to when maintaining the outside intake grill of a Unit Ventilator?
In reference to the Unit Ventilator grill, what is meant by QUANTITY of air?	In reference to the Unit Ventilator grill, what is meant by QUALITY of air?	How often should the dampers on a Roof Top Unit be checked to be sure they are working?	What pipe on a roof top unit emits sewer gas?

Supplemental Material: Ventilation Video Bingo Cards
(accompanies IAQ Lesson 5 — Ventilation Basics Video Inquiry)
Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

VENTILATION VIDEO BINGO CARDS

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VENTILATION VIDEO BINGO CARDS

Answer Key

How often should the filters be changed on a Unit Ventilator? Once a season	About 50% of ventilation systems in all schools are Unit Ventilators, what are the other half? Duct Systems	When using a Roof Top Unit for ventilation, when should the exhaust fans be running? All times students are in the building and whenever the building is occupied	When using a Roof Top Unit why do you NOT want to have standing water by the cooling module? Breading ground for mold and bacteria
What is IAQ (Indoor Air Quality)? The quality of the air inside of a building	What is one of the considerations faced when using a Roof Top Unit? Protecting the air at the intake grill	How do you get rid of polluted air that is inside the building? Get the air from outside in and the stale air out	What percentage of time do we spend inside of the school? 90%
When using a Unit Ventilator, what is the name of the equipment used to determine the volume of air flowing in or out of the classroom? Flow hood	How often should the filters be changed on a Roof Top Unit? Once a season	How many more times polluted is the air inside than the air outside? 2-5 times	What are two things to pay attention to when maintaining the outside intake grill of a Unit Ventilator? Quality and quantity
In reference to the Unit Ventilator grill, what is meant by QUANTITY of air? Clear – no blockage	In reference to the Unit Ventilator grill, what is meant by QUALITY of air? No fumes or outdoor pollution sources	How often should the dampers on a Roof Top Unit be checked to be sure they are working? Once a year	What pipe on a roof top unit emits sewer gas? Plumbing stack

Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Movement of Air
Diorama Activity

The purpose of this lesson is to foster an understanding of mechanical airflow.

TOPIC(S)			COMPOSITION OF AIR		DEFINING THE INDOOR ENVIRONMENT
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION	√	MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY

OBJECTIVE(S)
Students will describe the process of mechanical airflow by making a diorama and writing a 3 - 4 sentence description.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
1-3

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
Collect materials needed to build dioramas and place materials on a table for students to select.

Begin the lesson by building background knowledge about ventilation. Ask students what they think happens to allow air to move in and out of their classroom. Discuss

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why ventilation systems are necessary. Tell the students that they will be building a model that demonstrates the ventilation process. Show students enlarged pictures of ventilation systems from the IAQ Backgrounder (see Materials section) found in the EPA's *IAQ Tools for Schools* Action Kit and discuss.

Divide students into groups of three. Each group will have three "Construction Foreman" positions.

- Diorama Foreman *(oversees the making of the diorama)*
- Background Foreman *(oversees the making of the background for the diorama)*
- Summary Foreman *(oversees the writing of the summary)*.

Give students time in class to construct and label the dioramas. When they are completed, allow time to share.

MATERIALS

IAQ Backgrounder from the EPA's *IAQ Tools for Schools* Action Kit, shoeboxes, construction paper, clay, glue scissors, writing paper, pencil, duct tape, cotton balls, toothpicks, etc.

**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

GROUPING

whole class, small group

ASSESSMENT

Teacher can observe student participation. Diorama and summary can be checked for accuracy. Students will share the diorama and summaries with the class. Groups will answer questions generated by classmates.

MODIFICATIONS/EXTENSIONS

Have students work independently instead of small groups. Assign students all three types of ventilation systems, then compare and contrast the dioramas. Add to the dioramas as the unit progresses to include the topics of pollution and maintenance. Invite a maintenance/HVAC technician or custodian to the classroom to talk to the students.

CURRICULUM CONNECTIONS

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators K-2
  9: Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, Section 2, Pages 3-8

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Understanding the Indoor Environment
Movement of Air
Mind Map Activity

The purpose of this lesson is foster an understanding of mechanical airflow.

TOPIC(S)			COMPOSITION OF AIR		DEFINING THE INDOOR ENVIRONMENT
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION	√	MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY

OBJECTIVE(S)
The students will be able to describe mechanical airflow by creating a mind map of the ventilation process.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
6-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
Build your own background knowledge about ventilation using the Reference Guide (section 2, page 6) and IAQ Backgrounder (page 5) (see Resource section) from the EPA's *IAQ Tools for Schools* Action Kit. Ask the students questions about ventilation and have a class discussion. Indoor levels of pollutants may be two-five times (occasionally more than 100 times) higher than outdoor levels and we spend 90% of our time indoors. Ask students what they think happens to allow air to move in and out of their classroom. Review the definition and directions of mind mapping (or concept

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mapping) with the students. As the directions are explained, use chart paper to make an example of a mind map for the students using a simple concept that they have already mastered. Model the following mind mapping procedure:

1. Write down a central idea and generate new and related ideas which branch out from the center idea.
2. Turn the paper lengthwise (landscape). Use lines, arrows or some other symbols to show connections between the ideas generated on your mind map. Explain to the students that the process of developing the symbols and pictures to represent the key ideas on the mind map will help the brain remember. As the concepts on the mind map are developed by constructing meaning, the brain will be better able to recall the information.
3. Draw quickly on unlined paper without pausing, judging or editing. At this stage it is important not to eliminate any ideas (just as with typical brainstorming).
4. Labels can be added to the pictures to help explain key ideas or elaborate on one of the symbols. Leave lots of space so additions can be made to the mind map throughout the learning process.

Have the students create their own individual mind maps following the process you have modeled. After the mind maps are created have students share them with their peers by forming small groups and taking turns posting and explaining them (round robin style). Allow time for the students to dialogue and ask questions about the mind maps (such as why certain symbols were chosen). After sharing the mind maps in the small group, have the students select one person from each group to share their mind map with the whole class.

MATERIALS
chart paper, pencils, markers, highlighters, blank copy paper (one or two pieces per student)

GROUPING
whole class, small group, independent

ASSESSMENT
Teacher can observe and take anecdotal notes during the mind map creation and sharing stages. Teacher can collect the mind maps at the end of the lesson and evaluate each mind map for the student's understanding of airflow.

MODIFICATIONS/EXTENSIONS

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Students can create a class rubric to evaluate the mind maps. At the conclusion of a study on IAQ have the students create a mind map for each of the seven key topics area (listed on the chart at the beginning of this lesson plan). Have the students create the mind maps using only using pictures and symbols. Allow the students to use the mind maps at the end of the unit on a quiz or test. Publish a class book of the mind maps. Have the students use the mind maps to develop lessons to teach IAQ to other students. Go back to the mind map and add information about other key IAQ topics (when learned) such as sources of indoor air pollution. Invite a maintenance/HVAC technician or custodian to the classroom to talk to the students.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators 6-8
  10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)
- Performance Indicators (9-12)
  10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability

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Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit Reference Guide (section 2, page 6) and IAQ Backgrounder (page 5)

Understanding the Indoor Environment
Movement of Air
Physical Model Activity

The purpose of this lesson is foster an understanding of mechanical airflow.

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION	√	MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY

OBJECTIVE(S)
The students will be able to describe mechanical airflow which includes heating, ventilation and air conditioning (HVAC) by building a ventilation system model.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
3-5, 6-12 science

ESTIMATED TIME LENGTH
5 class periods

LESSON PROCEDURES
Session One
Write "HVAC" on the board. Ask students if they know what this acronym stands for. Have a class discussion accessing the students' prior knowledge. Explain HVAC systems to students using the diagrams from the IAQ Backgrounder (page 5) and the Reference Guide (section 2, page 4) (see Materials section) from the EPA's *IAQ Tools for Schools* Action Kit. Tell students they will be creating models of ventilation

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systems. Provide students with various materials to choose from to construct the model of their chosen ventilation system. Provide students access to reference materials, including the IAQ Backgrounder and the Reference Guide from the EPA's *IAQ Tools for Schools* Action Kit and the Internet to further their knowledge before creating the models. Display the "building materials" that will be available to the students. They will look at the "building materials" and draft a proposal for you. The proposal should include a sketch of the model with parts labeled and a list of materials the student plans to use in his/her design. If the students plan to use any materials from home they must include those in the plan as well. Tell the students they will be constructing their models in class two days from today. Give yourself time to review and approve their model proposals. Remind students they are making models (not exact replicas) that will demonstrate the basic function of a HVAC system. Labels should be used to make the model more realistic.

Session Two
Create a rubric with your students to evaluate the HVAC models.

Session Three/Four
Create and build the models.

Session Five
Have students display the models in the classroom. Allow time for students to tour the room to see the various models created. Split the class into two groups allowing students to stay with their models so they can explain them to classmates. At the end of the tour, ask the students to write a paragraph summarizing ventilation systems, their components, basic functions, and important maintenance considerations for promoting good IAQ.

MATERIALS
various model "building materials" such as cardboard and/or poster board (for the base of the models), straws, duct tape, glue, string, toothpicks, cotton balls, marshmallows, aluminum foil, paint, crayons, markers, paper cups, paper plates, rubber bands, coffee stirrers, popsicle sticks, tongue depressors, foam pieces, plastic wrap, paper, pencils; HVAC diagrams from the IAQ Backgrounder (page 5) and the Reference Guide (section 2, page 4)—both from the EPA's *IAQ Tools for Schools* Action Kit).
**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

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GROUPING
whole class, independent

ASSESSMENT
Teacher can observe for active participation and comprehension while the students are creating their models. Teacher can evaluate the summary paragraphs completed by the students at the end of the activity. Teacher can use the rubric created by the class to evaluate the completed project. Students can also self assess using the rubric.

MODIFICATIONS/EXTENSIONS
Have students investigate the careers and job duties of HVAC professionals and related careers. Have the students work with partners to create the models. Display the models and invite parents and community members to view the models. Invite a maintenance/HVAC technician or custodian to the classroom to talk to the students.

Short on time? Since time is so precious, if you are not able to implement this entire lesson, try these activities:

- *Place materials in a central location and have students recreate the diagrams by making physical models using materials provided*

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

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- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators 3-5
  6: Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
  8: Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
- Performance Indicators 6-8
  5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3 ,6)
  8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
  10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)
- Performance Indicators (9-12)
  6: Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
  8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
  10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit, Reference Guide (section 2, page 4) and IAQ Backgrounder (page 5)

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Identifying Indoor Environment Pollution Sources (List, Group, Label Activity)

The purpose of this activity is to develop understanding for the causes of indoor air pollution.

TOPIC(S)			COMPOSITION OF AIR		DEFINING THE INDOOR ENVIRONMENT
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
√	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY

OBJECTIVE(S)
The students will be able to categorize the causes of indoor air pollution.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
4-5, 6-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
In this lesson students will explore sources of indoor air pollution using the List/Group/Label strategy.

PHASE 1 - ACTIVATE PRIOR KNOWLEDGE
Ask students what they know about pollution (most responses may be geared towards outdoor pollution). Ask students how many of them believe that the indoor air can also

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be polluted. Explain to students that indoor levels of pollutants may be two-five times (occasionally more than 100 times) higher than outdoor levels and that we spend 90% of our time indoors. Tell students that they will be participating in an activity that will help them learn about indoor air pollution.

PHASE 2 - LISTING

Tell students they will be brainstorming about indoor air pollution. Write the topic on the board. Ask students to brainstorm about sources of indoor air pollution. Have them discuss the question with a partner or a small group. This will help them feel comfortable to verbalize their answers during the large group brainstorm. When the whole class gives you ideas record the responses on sentence strips with masking tape on one side. Post the ideas under the header on the board. At this point accept all answers. Guide their thinking as necessary by building your own background about the subject using the chart from the Reference Guide (section 2, page 4) (see Materials section) from the EPA's *IAQ Tools for Schools* Action Kit. Try to get around 25 ideas for pollution sources from the students.

PHASE 3 – GROUPING/LABELING

Have the students look on the board at the ideas they have brainstormed. Ask them to look for patterns or categories of ideas that seem to go together. Give them a few minutes to look over the ideas themselves. Then have them discuss the possible patterns or categories with a partner or small group for about five minutes. Next, ask the students to tell you the connections that they see. Move the ideas (sentence strips) around by *grouping* them together to represent what the students are telling you. At this point try to direct the students towards the four categories for typical sources of indoor air pollution (outside sources, building equipment, components/furnishings, and other indoor sources) without telling them the categories. After the sentence strips have been grouped together, ask the students to come up with *labels* for the groups that they have created. They may have more groups than the four categories represented on the chart found in the EPA's *IAQ Tools for Schools* Action Kit Reference Guide. You can guide their thinking for the labels so that they have the correct understanding of the categories for typical sources.

PHASE 4 – WRAP-UP

Have the students copy the List/Group/Label final product from the board into their own notes. Give each student a copy of the chart from Reference Guide. Have them compare the two independently. Have them write a summary paragraph outlining the similarities and differences between the chart they developed on the board and the one that was created by the EPA.

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

MATERIALS

chart from the Reference Guide (section 2, page 4) from the EPA's *IAQ Tools for Schools* Action Kit (one per student), sentence strips, masking tape, white board, dry erase markers

**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

GROUPING

whole class, small group, pairs, independent

ASSESSMENT

Teacher can observe for active participation during the activity. Teacher should observe the student's ability to accurately identify similarities and differences between the ideas and to appropriately make connections about the ideas in order to form the groups. Teacher can evaluate the student's independent writing sample to check for understanding.

MODIFICATIONS/EXTENSIONS

Make this lesson an independent, partner or center activity. Write each indoor air pollution source on an index card or list the sources on a blank piece of paper (photocopy and cut out). Place the index cards or slips of paper into envelopes. On colored paper or sentence strips write the four headings (outside sources, building equipment, components/furnishings, and other indoor sources). Have the students place the four headings on their desks and sort the words into the appropriate categories. Provide an answer key for them to check their work.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit, Reference Guide, chart (section 2, page 4)

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Preventing and Fixing Indoor Air Pollution
Venn Diagram Activity

The purpose of this lesson is to develop solutions to indoor environment problems.

TOPIC(S)			COMPOSITION OF AIR		DEFINING THE INDOOR ENVIRONMENT
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS	√	SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY

OBJECTIVE(S)
The students will be able to create a Venn Diagram comparing and contrasting solutions to indoor environment problems. The students will be able to determine if the solutions will prevent or fix/remediate the problems. The students will be able to create a written summary of the Venn Diagram.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
3-5, 6-12 (science, math, or language arts)

ESTIMATED TIME LENGTH
1-2 class periods

LESSON PROCEDURES
BACKGROUND
What is a Venn Diagram?

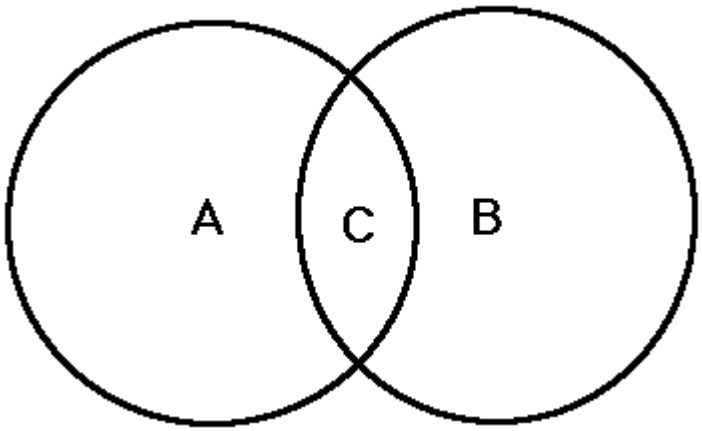
This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

A Venn Diagram is a graphic organizer made up of two or more overlapping circles. It is often used in mathematics to show relationships between sets. In language arts instruction, Venn Diagrams are useful for examining similarities and differences in characters, stories, poems, etc. A Venn Diagram enables students to organize similarities and differences visually.

Build your own background knowledge about solving indoor environment problems using the Reference Guide (section 4, pages 13-14 and section 6, pages 17-20) (see Resources section) from the EPA's *IAQ Tools for Schools* Action Kit.

PREPARATION

Prior to the lesson, post two pieces of chart paper. Label one piece with the heading "solutions" and on the other piece draw two overlapping circles (creating a Venn Diagram).



BRAINSTORM

Tell students they will be brainstorming solutions to problems caused by poor indoor air quality (IAQ). Record a list of the solutions that the students provide on the chart paper that you posted. Depending on the level of background knowledge, supplement the list of solutions as necessary. Tell the students that they will be comparing and contrasting the solutions on the list.

COMPARING AND CONTRASTING

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Introduce the characteristics of the Venn diagram using a simple concept such as comparing and contrasting apples and oranges. Refer to the two overlapping circles on the chart at the front of the room. Ask if anyone knows what kind of diagram it is. Explain that Venn diagrams are useful when you are trying to compare and contrast two subjects, two places, two things, or even two people. Explain that on the outsides, you contrast (put the things that are different). On the part where the circles come together, you compare (put the things that are the same). Explain the various parts of the Venn diagram to students.

Have the students work with a partner to make their Venn diagram.

MATERIALS
chart paper, markers

GROUPING
whole class, pairs, independent

ASSESSMENT
Teacher and student can evaluate the Venn Diagram using the Venn Diagram Assessment Rubric. Teacher can assess the student's summary.

MODIFICATIONS/EXTENSIONS
Have students use a Venn Diagram for other subject areas. Have the students research real life politicians and decision makers in your area. Rewrite the summary paragraph into a letter, and send the letter.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, (section 4, pages 13-14 and section 6, pages 17-20)
- http://teacher.scholastic.com
- http://readwritethink.org

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The purpose of this lesson is to allow students to demonstrate knowledge at the culmination of a unit of study about IAQ.

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS	√	SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY

OBJECTIVE(S)

The students will be able to design inventions that will prevent or fix indoor environment problems. The students will demonstrate an understanding for the process that inventors go through to identify a problem, investigate solutions, and develop inventions to meet the needs of the problem or situation.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry

- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives

- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND

4-5, 6-8 science, 9-12 science

ESTIMATED TIME LENGTH

5 class periods

LESSON PROCEDURES

In this lesson students will:

- read about inventors
- propose inventions to solve IAQ problems they have identified
- build models or draw diagrams of their proposed inventions

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- share their inventions when the class hosts an "Invention Convention"

PHASE 1 – PROJECT INTRODUCTION
Have a class discussion about the process of inventing. Discuss famous inventors and their inventions.

PHASE 2 – RESEARCH CURRENT IAQ INVENTIONS
Have a class discussion about poor indoor air quality (IAQ). Build your own background knowledge about IAQ using the EPA's *IAQ Tools for Schools* Action Kit (see Resources section). Post a list of problems caused by indoor air pollution. Discuss the root causes of these problems. In this discussion include a determination of whether an invention is the most efficient means to solve the problem, or if the problem could be more appropriately addressed with simple maintenance or awareness building. Could an invention address a simple maintenance or awareness issue? Discuss current inventions "on the market" that solve IAQ problems. Teacher will divide students into groups. Each group will conduct research on a current product "on the market" that claims to improve the IAQ in an indoor environment (such as a home or office building). Provide each group with magazines, catalogs (such as Sharper Image) and Internet access. Students will pick a product to research and then present to the class. They will explain what the equipment is, its function, cost and effectiveness. The group will create a visual aid using chart paper and make a five minute presentation to the class about the product.

PHASE 3 – *INVENT*
Have students select an IAQ problem and invent a product that can improve IAQ in schools. Provide students with a box of supplies (odds and ends). Students can make a prototype model (this model will not need to actually work) of the invention or a blueprint. A written proposal should also be submitted with the invention. In this proposal, students will need to explain why they chose the problem, how their invention works, and how it solves the problem (fixes or prevents). The proposal should also identify potential buyers, estimate product cost and include marketing ideas for the invention.

PHASE 4 – *INVENTION CONVENTION*
Designate a date and time to display the inventions in a central location in the school. Have a session during school for other students to attend. Have a session after school for parents (a great opportunity to promote public awareness about IAQ). Have the students design invitations and posters about the event. At the event students will display their model or blueprint and written proposal. They will stay with their inventions so that they can answer questions. As a class develop awards for the

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inventions and have the convention attendees vote anonymously for the winners. Announce the winners at the end of the convention. Provide refreshments.

MATERIALS
a box of odds and ends, books about inventors, paper, pencils, chart paper, markers

GROUPING
whole class, small group, independent

ASSESSMENT
Teacher can observe for active participation during the first and second phase of the project. Teacher can evaluate the student's inventions for addressing the problem and for design creativity. Teacher can evaluate written proposal.

MODIFICATIONS/EXTENSIONS
This lesson could be used as either an introduction or culminating activity for a unit on IAQ. Have students research and report on the patent process for new inventions. Invite a local inventor to class to talk about his or her invention.

Short on time? Since time is so precious, if you are not able to implement this entire lesson, try these activities:

- *Tell the students about HVAC systems (using EPA's IAQ Tools for Schools Action Kit diagrams* from the IAQ Backgrounder—page 5 and the Reference Guide—section 2, page 4)
- *Place materials in a central location and have students recreate the diagrams by making physical models using the materials provided*

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience

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- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators K-2
  8: Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)
  9: Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)
- Performance Indicators 3-5
  5: Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
  6: Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
  7: Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)
  8: Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
  9: Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)
- Performance Indicators 6-8
  4: Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)
  5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)
  6: Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
  7: Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)

- Performance Indicators (9-12)
  5: Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)
  6: Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
  7: Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)
  8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
  9: Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)
  10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition)

The purpose of this lesson is to allow students to demonstrate knowledge at the culmination of a unit of study about IAQ.

TOPIC(S)					
√	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS	√	SOURCES OF INDOOR AIR POLLUTION	√	MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
√	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS	√	SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY
				√	DEFINING THE INDOOR ENVIRONMENT

OBJECTIVE(S)

Students will be able to create a magazine that demonstrates their knowledge and understanding of IAQ.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry

- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives

- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND

2-5

ESTIMATED TIME LENGTH

6 class periods

LESSON PROCEDURES

SESSION 1 – PLANNING WITH STUDENTS

Tell students that they will be developing a class magazine to summarize their knowledge about indoor air quality (IAQ). Build your own background knowledge about IAQ using the EPA's *IAQ Tools for Schools* Action Kit (see Resources section).Provide samples of various magazines to students (at least one per group). Make a list of the basic sections of a magazine, for example advice columns and feature stories. Record the students' answers on chart paper and post for the class to

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see. After the list is complete, ask the students to identify sections that they would like to have in their magazine. On a separate piece of chart paper list the sections and leave room next to each one so that additional information can be added. Ask students to take a look at the list of proposed sections. Review each section and identify what the responsibilities will be for the person who completes that section. For example, the person or group that completes the cover page will need to determine the name of the magazine. This may mean that they will need to determine a method to gain input from their classmates as one of their responsibilities. After the responsibilities are written beside each section on the chart, ask for volunteers to take responsibility for each part. Record the names of those students on the chart next to the section. Ask for two students to take on the chief editing responsibilities and have these students assist you in compiling the magazine into one document. For the other sections students can work in partners or small groups, depending on the task.

SESSIONS 2 THRU 5 - CREATING THE MAGAZINE

Have the students create their sections using the computer (word processing and graphics). They will save their articles and graphics. The chief editors will copy and paste their sections into the main magazine document and format the final product. The document should be on legal paper with the landscape as the page set-up. The pages will be glued with the backs touching and folded into a booklet. The document should be formatted to support this process.

SESSION 6 – WRAP-UP

Print a magazine for each student. Pass out the magazine and have a "Wrap-Up Party" to assemble the magazine. Have the students glue the pages together with the printed sides facing out. After the magazine is glued to form thick pages, fold and staple each copy into a booklet. Afterwards, have each student write a paragraph about the project by answering the following questions:

- *What facts were included in the project?*
- *What did you learn from the project?*
- *What did you enjoy most about the project?*

MATERIALS

markers, chart paper, access to computers with basic word processing and graphics/publishing software, legal size copy paper, staples/stapler, glue, magazines

GROUPING

whole class, small group, independent

ASSESSMENT

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Teacher can observe for active participation during the project. Teacher can evaluate the magazine for overall understanding of IAQ. Teacher can evaluate written product from the Wrap-Up Phase.

MODIFICATIONS/EXTENSIONS

Have the students create a school website site that features an online version of the magazine. Turn the magazine into an "Owners Manual for Your School". Consider sending it to school officials and to EPA to be shared with other schools.

Short on time? Since time is so precious, if you are not able to implement this entire lesson, try these activities:

- *Eliminate the planning phase by predetermining the magazine sections and assigning each group a part*

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? */*What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

- Performance Indicators K-2
  8: Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)
  9: Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)
- Performance Indicators 3-5
  5: Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
  6: Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
  7: Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)
  8: Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
  9: Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)
- Performance Indicators 6-8
  4: Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)
  5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)
  6: Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
  7: Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)
  8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
  10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)
- Performance Indicators (9-12)
  5: Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)
  6: Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
  7: Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)
  8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
  9: Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition)

The purpose of this lesson is to allow students to demonstrate knowledge at the culmination of a unit of study about IAQ.

TOPIC(S)					
√	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS	√	SOURCES OF INDOOR AIR POLLUTION	√	MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
√	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS	√	SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)		VOCABULARY

OBJECTIVE(S)

The students will be able write and deliver an effective speech in a large-group setting.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry

- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives

- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND

4-5, 6-8 science, 9-12 science

ESTIMATED TIME LENGTH

5 class periods

LESSON PROCEDURES

PREPARATION

Schedule the project. Students will need access to computers with presentation software. They will also need time to practice and critique speeches in small groups. Create and publish a list of assigned dates and class periods for speeches. Students should have this list a few weeks to get ready. Schedule no more than six speeches per forty-minute class period to allow for questions and set-up between speeches.

PHASE 1 - INTRODUCTION

Activate prior knowledge about persuasive speeches. During a class discussion, discuss how people make decisions based on what they see and hear. Explain that sometimes we have to use skills to convince others about our positions, sometimes called persuasive speeches. Have the students recall and list their own experiences trying to convince their friends about something, and then ask them to share these with the class.

PHASE 2 – DEVELOP A LIST OF CHARACTERISTICS

If possible, watch video tapes of highly effective persuasive speeches. Discuss elements of the speech (opening, key points, closing, length, factual support of topic, etc.) and delivery (body language, articulation, pronunciation, pitch, eye contact, hand gestures, etc.) As a class develop a rubric to evaluate the presentations.

PHASE 3 – DEVELOP PRESENTATIONS

Tell students that they will be making presentations to school board members to persuade them to create a policy for the school district that mandates that each school have an IAQ Team and IAQ Management Plan based off guidance found in the EPA's *IAQ Tools for Schools* Action Kit (see Materials section). Students will draft, exchange, revise, and type their proposals for the presentation. You will need several copies of the EPA's *IAQ Tools for Schools* Action Kit to assist students in developing their presentations. They will also need time to research IAQ for themselves using the Internet and print material. Keep a list of the characteristics developed during Phase 2 posted in the room. Give them several class periods to develop the presentations.

PHASE 4 – GIVE PRESENTATIONS

Follow the schedule for speakers as posted, adjusting for absences. Remind students about the characteristics of a good audience and a good listener. Remind them of the items on the rubric that relate to being a good audience. Have students make their presentations. Allow time for questions and answers after each speech.

MATERIALS

markers, chart paper, access to computers with Internet access and presentation software, several copies of the EPA's *IAQ Tools for Schools* Action Kit.

**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

GROUPING

whole class, small group, independent

ASSESSMENT

Evaluate students for delivery and content of their presentation using the rubric.

MODIFICATIONS/EXTENSIONS

Send invitations to school board members and other key players (principals, counselors, parents, etc.) to hear the presentations. After the students give the presentations to their classmates have them vote on one or two presentations. Then schedule time at an upcoming school board meeting to deliver the presentations. Give students choices for their school board presentation topics. Include options such as, restoring the indoor habitat or what we can learn from our building, etc. Have students work in small groups and co-present.

Short on time? Since time is so precious, if you are not able to implement this entire lesson, try these activities:

- *Give students time (in small groups) to explore the EPA's IAQ Tools for Schools Action Kit*
- *Have students make a list of the benefits to utilizing the kit as a school*
- *Have students use this list to design a mock presentation for school board members*

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 6: Students apply knowledge of language structure, language conventions (e.g., spelling and punctuation), media techniques, figurative language, and genre to create, critique, and discuss print and nonprint texts
- 7: Students conduct research on issues and interests by generating ideas and questions, and by posing problems. They gather, evaluate, and synthesize data from a variety of sources (e.g., print and nonprint texts, artifacts, people) to communicate their discoveries in ways that suit their purpose and audience
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

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- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators K-2
  8: Create developmentally appropriate multimedia products with support from teachers, family members, or student partners. (3)
  9: Use technology resources (e.g., puzzles, logical thinking programs, writing tools, digital cameras, drawing tools) for problem solving, communication, and illustration of thoughts, ideas, and stories. (3, 4, 5, 6)
- Performance Indicators 3-5
  5: Use general purpose productivity tools and peripherals to support personal productivity, remediate skill deficits, and facilitate learning throughout the curriculum. (3)
  6: Use technology tools (e.g., multimedia authoring, presentation, Web tools, digital cameras, scanners) for individual and collaborative writing, communication, and publishing activities to create knowledge products for audiences inside and outside the classroom. (3, 4)
  7: Use telecommunications and online resources (e.g., e-mail, online discussions, Web environments) to participate in collaborative problem-solving activities for the purpose of developing solutions or products for audiences inside and outside the classroom. (4, 5)
  8: Use technology resources (e.g., calculators, data collection probes, videos, educational software) for problem solving, self-directed learning, and extended learning activities. (5, 6)
  9: Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)
- Performance Indicators 6-8
  4: Use content-specific tools, software, and simulations (e.g., environmental probes, graphing calculators, exploratory environments, Web tools) to support learning and research. (3, 5)
  5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)
  6: Design, develop, publish, and present products (e.g., Web pages, videotapes) using technology resources that demonstrate and communicate curriculum concepts to audiences inside and outside the classroom. (4, 5, 6)
  7: Collaborate with peers, experts, and others using telecommunications and collaborative tools to investigate curriculum-related problems, issues, and information, and to develop solutions or products for audiences inside and outside the classroom. (4, 5)
  8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
  10: Research and evaluate the accuracy, relevance, appropriateness, comprehensiveness, and bias of electronic information sources concerning real-world problems. (2, 5, 6)
- Performance Indicators (9-12)
  5: Use technology tools and resources for managing and communicating

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personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)
6: Evaluate technology-based options, including distance and distributed education, for lifelong learning. (5)
7: Routinely and efficiently use online information resources to meet needs for collaboration, research, publication, communication, and productivity. (4, 5, 6)
8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)
9: Investigate and apply expert systems, intelligent agents, and simulations in real-world situations. (3, 5, 6)
10: Collaborate with peers, experts, and others to contribute to a content-related knowledge base by using technology to compile, synthesize, produce, and disseminate information, models, and other creative works. (4, 5, 6)

Math, National Council of Teachers of Mathematics, Math Standards

- Data Analysis and Probability
  Formulate questions that can be addressed with data and collect, organize, and display relevant data to answer

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition)

Understanding the Indoor Environment
Vocabulary Development
ABC Book

The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about Indoor Air Quality (IAQ).

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY-Integrates most or all of the preceding topics

OBJECTIVE(S)
The students will be able to demonstrate an understanding of vocabulary words by using the words to create an ABC book.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
3-5, 6-8 science

ESTIMATED TIME LENGTH
6 class periods

LESSON PROCEDURES
1. Place art supplies (see Materials section) in a central location in the classroom.
2. Display several ABC books in a special area in the room. See Resources section for links to book lists.
3. Collect reference materials and place them in a central location in the classroom (encyclopedias, dictionaries, thesauruses, EPA's *IAQ Tools for Schools* Action Kit, articles and books about IAQ). Post a list of IAQ web sites,

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also post sites related to the reference sites, such as www.dictionary.reference.com/. See Resources section for suggested IAQ websites.

4. Select two sample ABC books for a read aloud. Make sure one of the books has simple text and is geared towards younger children, and the other book has more text and additional information geared towards older children.
5. Read the two ABC books to the class. Have a class discussion about the differences between the books. Discuss the purpose accomplished by both books. Discuss what can be learned from both types of books.
6. Place students in small groups and give them time to explore a few of the other ABC books. Ask them to have a small group discussion about the characteristics of the ABC books. (Give students 10 -15 minutes to explore and discuss).
7. As a whole class, make a list on chart paper of ABC book characteristics.
8. Tell the students that they will be making their own ABC books with vocabulary words for IAQ. They will use each word in context and illustrate it in their ABC books. They can choose the style of writing for their book. For example, they may choose to write poems or rhymes, jokes, list facts, or make charts.
9. As a class, develop a rubric to evaluate the finished product based on the characteristics and parts of ABC books. In the rubric, include necessary skills such as using a dictionary.
10. As a class, create a timeline for completion of the project. Post the rubric and timeline on chart paper in the front of the room.
11. Independently, have students identify an IAQ word or concept phrase to use for each letter of the alphabet using the attached **ABC Book Planning Sheet** (see Materials section). Students can use any of the reference materials, IAQ materials, or websites for assistance during this phase. If students are having difficulty finding words that start with letters like “X”, they can use a word that has the letter or the sound that the letter makes somewhere within the word. (For example the word exit for the letter “X”).
12. Approve their **ABC Book Planning Sheet** before moving on to the rough draft.
13. Students write a rough draft of the ABC book using the **ABC Book Rough Draft Planning Packet** (see Materials section).
14. Approve their **ABC Book Rough Draft Planning Packet** before moving on to the final draft.
15. Students create the final draft and bind their ABC books using the paper and art materials of their choice.
16. Have the students share their books by reading them aloud to a small group of classmates. Display the books in the classroom.

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MATERIALS

IAQ Vocabulary List (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc), **ABC Book Planning Sheet**–one per student (see IAQ Lesson 14 Supplement_ABC Book Planning Sheet.doc), **ABC Book Rough Draft Planning Packet**–one per student (see IAQ Lesson 14 Supplement_ABC Book Rough Draft Planning Packet.doc), pencils, heavy weight paper (cardstock or construction) in various sizes and colors, various art supplies and craft scissors, various book binding supplies (hole punches, ribbon, string, etc.).

GROUPING

whole class, small group

ASSESSMENT

Teacher can use the rubric created by the class to evaluate the completed project. Students can self assess using the rubric as well. Teacher can observe during the project for participation during the small group activity and whole class discussion about ABC book characteristics.

MODIFICATIONS/EXTENSIONS

Have the students work in small groups or with partners to create the ABC books. Find an elementary school class to partner with, loan the ABC books to them. Use the computer to publish the ABC books or create online interactive ABC books. Have the ABC books displayed at the school or local library.

Short on time? Since time is so precious, if you are not able to implement this entire lesson, try these activities:

- *Assign each student a letter and complete the alphabet book as a class, by having each student create a page.*

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

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- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators 3-5
  9: Determine when technology is useful and select the appropriate tool(s) and technology resources to address a variety of tasks and problems. (5, 6)
- Performance Indicators 6-8
  5: Apply productivity/multimedia tools and peripherals to support personal productivity, group collaboration, and learning throughout the curriculum. (3, 6)
  8: Select and use appropriate tools and technology resources to accomplish a variety of tasks and solve problems. (5, 6)
- Performance Indicators (9-12)
  5: Use technology tools and resources for managing and communicating personal/professional information (e.g., finances, schedules, addresses, purchases, correspondence). (3, 4)
  8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit, (3rd Edition), Reference Guide, Appendix M, Pages 79-84
- http://www.education-world.com/a_books/books065.shtml
- http://www.suelebeau.com/abcbooks.htm
- http://dictionary.reference.com
- http://www.epa.gov/schools/

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ABC Book Rough Draft Planning Packet

Name _____

Please create a rough draft for your ABC book using this packet. Each page should include the text and a rough sketch of the illustration.

Supplemental Material: ABC Book Rough Draft Planning Packet
(accompanies IAQ Vocabulary Development Lesson 14 – ABC Book)
Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

ABC Book Rough Draft Planning Packet

Front Cover

Title Page

Supplemental Material: ABC Book Rough Draft Planning Packet
(accompanies IAQ Vocabulary Development Lesson 14 – ABC Book)
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ABC Book Rough Draft Planning Packet

Dedication/About the Author Page

Copy 26 of this page and label each page with a letter of the alphabet.

Letter _____

Supplemental Material: ABC Book Rough Draft Planning Packet
(accompanies IAQ Vocabulary Development Lesson 14 – ABC Book)
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ABC Book Rough Draft Planning Packet

Back Cover

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ABC Book Planning Sheet

Name _____

Please list the IAQ word that you plan to use for each letter of the alphabet in your ABC Book.

A	**N**
B	**O**
C	**P**
D	**Q**
E	**R**
F	**S**
G	**T**
H	**U**
I	**V**
J	**W**
K	**X**
L	**Y**
M	**Z**

Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Vocabulary Development
Deck of Word Cards

The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about Indoor Air Quality (IAQ).

TOPIC(S)			COMPOSITION OF AIR		DEFINING THE INDOOR ENVIRONMENT
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY-Integrates most or all of the preceding topics

OBJECTIVE(S)
The students will be able to recall definitions of vocabulary words.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
4-5, 6-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
1. Prior to the lesson, read the **IAQ Vocabulary List** (see Materials section) and select the words that you would like for your class to learn.
2. Make an index card with a sample sentence for each of the IAQ words you have chosen. Make an envelope for each vocabulary word with the word written on the front. Insert the index cards into the envelopes.
3. "Deal" envelopes to students like a deck of cards giving each student one envelope.

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4. Give each student several blank index cards. Tell students to write a sentence on a card using the vocabulary word on the outside of the envelope. They may not look at the index card inside until after they have written their sentences. Then they may look at the index card to check that the word has been used correctly.
5. Have students put the index card into the envelope (with their names on the cards) and place the envelope in the "discard" pile in the front of the classroom.
6. Have students select a new envelope from the "pick-up" pile in the front of the classroom.
7. When the "pick-up" pile is empty, recycle the "discard pile".
8. Continue "play" as time permits.

MATERIALS

IAQ Vocabulary List (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc), envelopes (one per vocabulary word), index cards (one per vocabulary word and approximately five per student)

GROUPING

whole class, independent

ASSESSMENT

Teacher can evaluate the index cards for the student's ability to use the word correctly in the sentence.

MODIFICATIONS/EXTENSIONS

Have students work in pairs or small groups to complete this activity. Set the activity up in a classroom center for students to practice regularly.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

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Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, Appendix M, Pages 79-84

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Vocabulary Development
Dictionary Game

The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about Indoor Air Quality (IAQ).

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY-Integrates most or all of the preceding topics

OBJECTIVE(S)
The students will be able to learn new vocabulary words.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
4-5, 6-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
1. Select a word from the **IAQ Vocabulary List** (see Materials section) that most students can define.
2. Each student (or group of students if you choose to play in teams) will write a made-up definition for the word selected. (You may need to model the writing of a fake definition so that students can see how to do it). During the game you will write the real definition for each selected word. Have students write

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definitions on the same kind of paper so they do not know which definition is yours.

3. All definitions are turned in and read aloud by you. Read all definitions for each selected word twice.
4. Ask students to vote for a definition when you read for the second time. They will vote for the definition that they believe is the real one.
5. Explain to students that points are scored in two ways:
   - When someone votes for the fake definition that their team creates as the real one (one point per vote).
   - When they vote for the correct definition (two points).
6. Repeat the process for each vocabulary word selected.
7. The winner is the student or team with the most points.
8. At the end of the game review the correct definitions. Have the students use the correct definitions to create a vocabulary list.

MATERIALS

IAQ Vocabulary List (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc), identical pieces of paper

GROUPING

whole class, small group

ASSESSMENT

Teacher can observe for active participation and meaning comprehension during the activity. If using the modification suggestion (see below), teacher can collect the graphic organizers and evaluate for accurate definitions.

MODIFICATIONS/EXTENSIONS

At the beginning of the activity give the students an graphic organizer with the vocabulary words you select for the activity. As the game progresses, allow time between turns for the students to record the correct definitions (in their own words) on the graphic organizer.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.

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- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, Appendix M, Pages 79-84

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Vocabulary Development
Listening for Vocabulary Words

The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about Indoor Air Quality (IAQ).

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY-Integrates most or all of the preceding topics

OBJECTIVE(S)
The students will be able to identify definitions for vocabulary words.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
3-5, 6-8 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
1. Using the **IAQ Vocabulary List** (see Materials section), select as many vocabulary words as there are students in half of your class. (If you have 30 students select 15 words).

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2. Write each selected vocabulary word on two different index cards. Make enough cards for each student to have one card. Keep a copy of the words and definitions for yourself.
3. Pass the cards out to the students. Ask the students to stand when they hear the definition for the word on their card. (Two students should stand). Have a class discussion to make sure that the words on the cards of the students who stand match the definition you read.
4. Have the students who stand work together to write a sentence using the word correctly.
5. Have the students write the sentence on the board. Have a class discussion about the accuracy of the sentence.

MATERIALS

IAQ Vocabulary List (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc), index cards, dry erase board and markers

GROUPING

whole class, small group

ASSESSMENT

Teacher can observe for active participation and meaning comprehension during the activity. Teacher can evaluate the sentences written on the board.

MODIFICATIONS/EXTENSIONS

Have the students develop the sentences and write them on the board independently. Do not erase the sentences as you proceed with the activity, have the students use all of the sentences to organize a paragraph or essay about the topic. Use the sentences that the students develop for a fill in the blank activity to be used in the next lesson or at a classroom center.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? */*What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, Appendix M, Pages 79-84

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Vocabulary Development
Acquiring New Vocabulary Through Discussion Groups

The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about Indoor Air Quality (IAQ).

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY-Integrates most or all of the preceding topics

OBJECTIVE(S)
The students will be able to locate unfamiliar words within an assigned text and determine their meaning using a variety of strategies (e.g., prior knowledge, context clues, group discussion, and media sources). The students will be able to acquire new vocabulary identified from the assigned text.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**Standards for other content areas are listed further in the lesson plan in the "curriculum connections" section*

SUGGESTED GRADE BAND
9-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
Prior to the lesson, read the text selection and make note of any words that may be unfamiliar or interesting to your students. Bookmark related websites for students to use during their group work. Arrange for students to have access to the Internet.

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PHASE 1 – INTRODUCTION

To introduce the activity, choose a word to model the strategy/process that students will later use in their small group work.

- Select a paragraph from the IAQ Backgrounder (see Materials Section) found in the EPA's *IAQ Tools for Schools* Action Kit that contains the word.
- Ask the students to suggest their ideas of what the word means. Students can demonstrate their ideas using words and body movements.
- Give students a definition such as one from www.dictionary.reference.com/ or the **IAQ Vocabulary List** (see Resources section).
- Using a thesaurus, identify synonyms for the word and then use each one to see if it makes sense within the context of the original sentence.

Ask students if they have any questions or comments about how to use this strategy when determining the meaning of an unfamiliar word. Model a few more examples as necessary.

PHASE 2 – SMALL GROUP ACTIVITY

Divide the class into small groups and provide one copy of the IAQ Backgrounder to each group. Assign each student in the group a role and make sure that they understand their individual responsibilities. Roles include:

- Vocabulary Enricher–identifies interesting or unfamiliar words in the reading and leads a discussion about the new words
- Literary Luminary–relates the new words back to the context of the passage, and provides supporting definitions by accessing a dictionary or other media sources such as the **IAQ Vocabulary List** (see Materials section)
- Connector–makes a connection between the meaning of words as used in the context of the text and prior knowledge or understanding
- Discussion Director–facilitates the discussion among members of the group
- Summarizer–records and reports the group's activities to the whole class (similar to a secretary or reporter)

Tell students the group's task is to locate and creatively define unfamiliar or interesting words from the IAQ Backgrounder. During the task, students should look at the context of the surrounding sentences, engage in a group discussion about the new words, draw upon their prior knowledge of the word or topic, and access print and online resources (such as www.dictionary.reference.com/) for supporting definitions.

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PHASE 3 – WHOLE GROUP DISCUSSION
Ask the Summarizer from each group to share the group's activities with the whole class. Create a chart to record each group's findings as the Summarizer presents them. Relate the new words that students have identified back to the text. Engage in a whole class discussion of the text, reinforcing the new vocabulary and students' understanding of the text.

PHASE 4 – INDEPENDENT PRACTICE
Have the students independently read the IAQ Backgrounder. Ask students to choose one word that they learned during this session. Have them write their understanding of the word's definition, copy the sentence from the text highlighting the specified word, rewrite the sentence substituting a synonym for the word that makes sense within the context of the sentence, and then provide an illustration of the word.

MATERIALS
IAQ Vocabulary List—one per student (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc), IAQ Backgrounder from the EPA's IAQ Tools for Schools Action Kit (one per student), chart paper

**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

GROUPING
whole class, small group, independent

ASSESSMENT
Teacher can observe during the activity for student participation in the discussion and role behavior. Teacher can collect and evaluate students' written responses for accuracy.

MODIFICATIONS/EXTENSIONS
Have students keep a word log during any reading time as a way to repeat this activity on an independent level. Practice the strategy using words that students encounter during their other classes. Have the students locate scientific articles about IAQ (they can form groups and read the article using this strategy). If you locate a longer article about IAQ have the students read the article using a Jigsaw reading strategy in combination with this activity.

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 8: Students use a variety of technological and information resources (e.g., libraries, databases, computer networks, video) to gather and synthesize information and to create and communicate knowledge
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? */*What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

Technology, International Society for Technology in Education (ISTE), National Educational Technology Standards Project (NETS)

- Performance Indicators (9-12)
  8: Select and apply technology tools for research, information analysis, problem solving, and decision making in content learning. (4, 5)

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide (Appendix M, pages 79-84) and the IAQ Backgrounder
- **IAQ Vocabulary List**—one per student (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc)
- readwritethink.org

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Vocabulary Development
Vocabulary Puzzles

The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about Indoor Air Quality (IAQ).

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY-Integrates most or all of the preceding topics

OBJECTIVE(S)
The students will be able to create and complete a puzzle using the definitions of their vocabulary words.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards

6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards

Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
4-5, 6-12 science

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
1. Make copies of the **Puzzle Template**—one per student (see Materials section) on heavy weight paper, such as card stock.
2. Provide an **IAQ Vocabulary List** (see Materials section) to the students. If the vocabulary list is a part of an ongoing IAQ unit, then the students can use a list of words and definitions that have been previously introduced.

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3. Give each student a **Puzzle Template**.
4. On the back (blank) side of the template, have students design a puzzle using a designated number (your choice) of the vocabulary words and definitions. They can use words and illustrations to compete the design. The words, definitions, and illustrations need to be written or drawn across more than one puzzle piece. If the students were to copy a word and definition onto each puzzle piece, then there would be nothing to "figure out" when putting the puzzle back together.
5. Have students turn the puzzle over to the pre-printed side to cut out the pieces. Place the pieces in a bag or envelope.
6. Assign each student a partner, have the partners exchange and complete the puzzles.
7. Have students check on their partner's completed puzzles for accuracy.

MATERIALS

Puzzle Template—one per student (see IAQ Lesson 19 Supplement_Puzzle Template.doc), **IAQ Vocabulary List**—one per student (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc), markers, crayons, colored pencils, bags or envelopes (one per student)

GROUPING

whole class, small group

ASSESSMENT

Teacher can observe for active participation and meaning comprehension while the students are creating and completing the puzzles. If using the modification suggestion (see below), teacher can collect the puzzles before the students exchange them with a partner to evaluate for accurate definitions.

MODIFICATIONS/EXTENSIONS

Keep the puzzles in a classroom center, allow the students to select and complete puzzles throughout an IAQ unit, as time permits. Pre-select the vocabulary words for each student to use in the puzzle. Provide the words, not the definitions. Have the students look up the words to determine the definitions that they will use to complete the puzzle.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? */*What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, Appendix M, Pages 79-84

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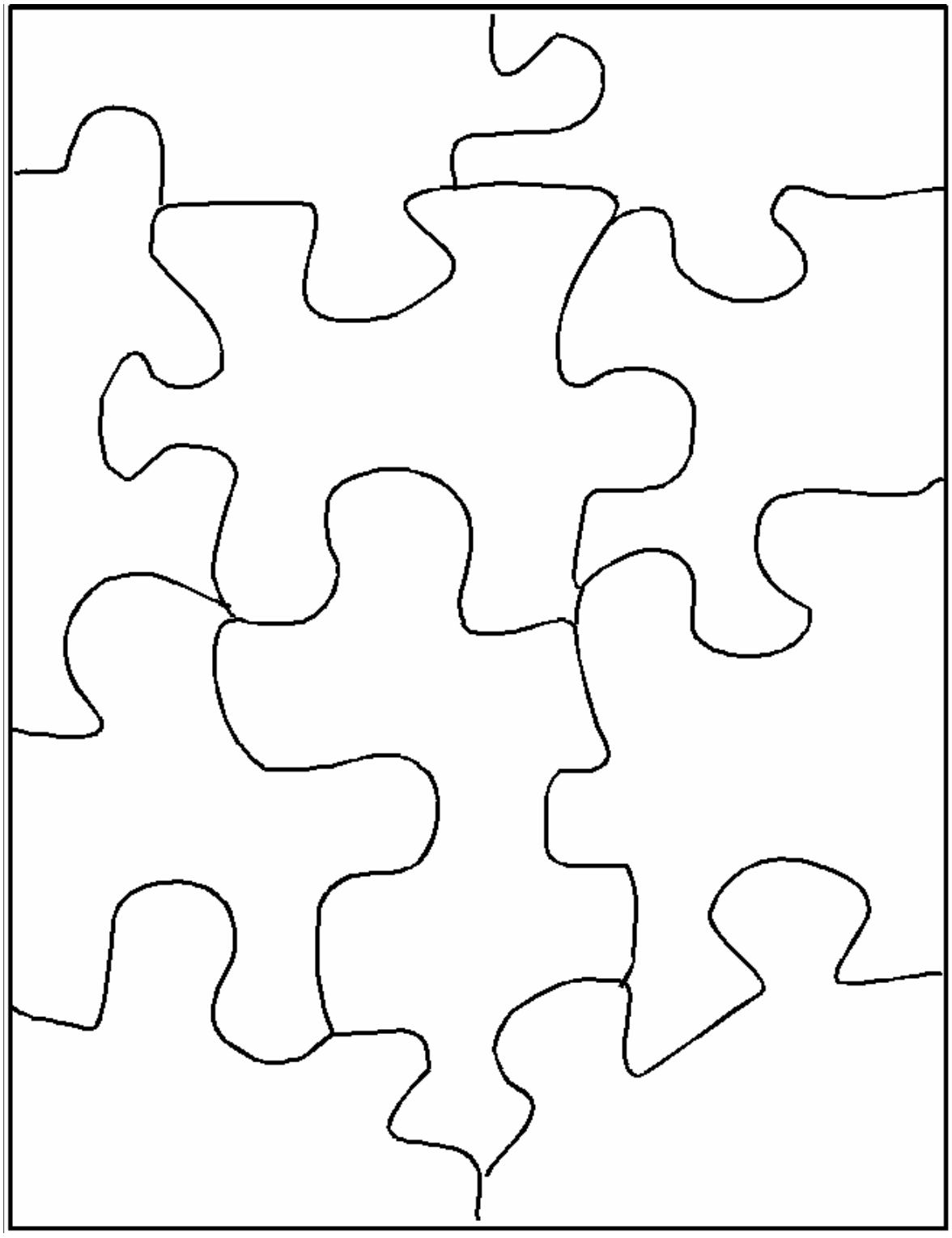
PUZZLE TEMPLATE



Supplemental Material: Puzzle Template
(accompanies IAQ Vocabulary Development Lesson 19 – Vocabulary Puzzles)
Developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Vocabulary Development
Vocabulary Zoo

The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about Indoor Air Quality (IAQ).

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY-Integrates most or all of the preceding topics

OBJECTIVE(S)
The students will be able to recall new vocabulary words and definitions.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
K-5

ESTIMATED TIME LENGTH
1 class period

LESSON PROCEDURES
1. Prior to the lesson read the IAQ Backgrounder (see Materials section) found in the EPA's *IAQ Tools for Schools* Action Kit and/or the **IAQ Vocabulary List** (see Materials section) make note of any words that may be unfamiliar or interesting to your students. Try to list at least ten words.
2. Provide each student with the list of words.

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3. Read the list of words to the students. Then tell them that you are going to read IAQ reference material (the IAQ Backgrounder) aloud to them that includes the words you have chosen.
4. Direct students to make the sound of their favorite animal whenever they hear one of the words on the list. Each time the students make their favorite animal noises (the "Vocabulary Zoo"), stop and discuss what the students think the word means and how it is used in the context of the article/story as well as in everyday conversation.
5. Record the word and the definition provided by the students on the chart paper.
6. Read the story/article a second time to see whether students remember the meaning of the words.

MATERIALS

IAQ Vocabulary List (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc), IAQ Backgrounder from the EPA's *IAQ Tools for Schools* Action Kit, teacher generated list of words, chart paper

**To order EPA's Indoor Air Quality Tools for Schools (IAQ TfS) Action Kit or any of the supplemental materials found in the Kit, contact IAQ INFO at 800-438-4318 or visit http://www.epa.gov/iaq/schools/actionkit.html.*

GROUPING

whole class

ASSESSMENT

Teacher can question students after the second reading. Teacher can ask the students to write a journal entry using their own words and pictures to describe the meaning of the ten words. Teacher can evaluate journal entry.

MODIFICATIONS/EXTENSIONS

Assign each student a specific word to listen for, when they hear the word, they can make the animal sound and then give the definition of the word to the rest of the class.

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

RESOURCES

- EPA's *IAQ Tools for Schools* Action Kit (3rd Edition), Reference Guide, Appendix M, Pages 79-84

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

Understanding the Indoor Environment
Vocabulary Development
Word Walls

The purpose of this lesson is to develop an understanding for the meaning of vocabulary words during a study or unit about Indoor Air Quality (IAQ).

TOPIC(S)					
	EFFECTS OF INDOOR AIR POLLUTION ON OCCUPANTS		SOURCES OF INDOOR AIR POLLUTION		MOVEMENT OF AIR Natural and mechanical airflow (HVAC)
	IDENTIFYING INDOOR ENVIRONMENT POLLUTANTS		SOLVING INDOOR ENVIRONMENT PROBLEMS (Preventing and Fixing)	√	VOCABULARY-Integrates most or all of the preceding topics

OBJECTIVE(S)
The student will be able to identify and define words that appear on the word wall.

SCIENCE/HEALTH STANDARD CORRELATIONS

National Science Education Standards, Science Content Standards
6.1 Science as Inquiry
- Levels K-12: Abilities necessary to do scientific inquiry, Understanding about scientific inquiry

6.6 Science in Personal and Social Perspectives
- Levels K-4: Personal Health; Changes in environments
- Levels 5-8: Personal Health; Populations, resources, and environments, Natural hazards
- Levels 9-12: Personal and community health; Environmental quality; Natural and human-induced hazards

Mid-continent Research for Education and Learning (McREL), Science Standards
Earth and Space Sciences 1.1, 1.4, 1.5 and Physical Sciences 8.1, 8.3, 8.5

**See "Curriculum Connections" section for standards that apply to other content areas.*

SUGGESTED GRADE BAND
K-12

ESTIMATED TIME LENGTH
1 class period to create the word wall
5-10 minutes per class period to review and work with the words on the word wall each day

LESSON PROCEDURES
BACKGROUND
A word wall is a systematically organized collection of words displayed in large letters on a wall or another large display place in the classroom. It is a tool to use, not just a display for words. Word walls are designed to promote group learning. This lesson

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plan includes five word wall activities to be used with a content themed word wall for IAQ.

To create the word wall with your students:

1. Prior to the lesson, use the **IAQ Vocabulary List** (see Materials section) to select the words for your word wall.
2. Try to select as many words as you have students in your class.
3. Select words that are appropriate for your grade level and learning objectives.
4. Assign each student in the class a vocabulary word with which they will create a word wall card.
5. Have the students research the meaning of their assigned word using a dictionary or the Internet and write the definition on the back of the card.
6. Tell students that the front of the card must include the word which should be printed legibly and large enough to be read from all areas in the room.
7. Tell students that the card must also have some type of visual clue that will help their classmates remember the definition of the word.
8. After the cards are complete, collect the cards and post them in the classroom on a designated spot on the wall that is visible to the students. Place a header above the words to identify the theme of the word wall. You may want to have the students assist you in developing a motivating and inviting title or theme for the word wall. For example, use the title “IAQ Rocks” and write the words on large pieces of colored paper cut out to look like rocks or use a title like “Read the Writing on our IAQ Word Wall”.
9. After the wall is constructed, use some of the suggested activities below to work with and review the words daily. For detailed direction on the games and activities, the links for the websites are provided.

MATERIALS
IAQ Vocabulary List—one per student (see IAQ Lessons 14-21 Supplement_Vocabulary List.doc), 5 x 7 index cards (one per student), wall space

GROUPING
whole class, small group, independent

ASSESSMENT
Teacher can collect and evaluate the word cards for accurate definitions before posting on the wall. Teacher can observe for active participation and meaning comprehension during the suggested games and activities.

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

MODIFICATIONS/EXTENSIONS

Use the following suggested games and activities after the word wall is created.

OOPS!

http://www.education-world.com/a_lesson/04/lp328-01.shtml

Erasing Relay

http://www.education-world.com/a_lesson/04/lp328-02.shtml

Hot Seat

http://www.education-world.com/a_lesson/04/lp328-04.shtml

Vocabulary Toss

http://www.education-world.com/a_lesson/04/lp328-05.shtml

Word Wall Bingo

http://www.mrsalphabet.com/wordwallbingo.html

Be a Mind Reader

http://www.ga.k12.md.us/ReadingChal/activity_4.htm

CURRICULUM CONNECTIONS

Reading and Language Arts, International Reading Association and National Council of Teachers of English Standards, Standards for the English Language Arts

- 4: Students adjust their use of spoken, written, and visual language (e.g., conventions, style, vocabulary) to communicate effectively with a variety of audiences and for different purposes.
- 5: Students employ a wide range of strategies as they write and use different writing process elements appropriately to communicate with different audiences for a variety of purposes
- 12: Students use spoken, written, and visual language to accomplish their own purposes (e.g., for learning, enjoyment, persuasion, and the exchange of information)

Social Studies, Center for Civic Education, National Standards for Civics and Government

- Content Standard K-12, V: What are the Roles of the Citizen in American Democracy? /What are important responsibilities of Americans?

Health, American Alliance for Health, Physical Education, Recreation and Dance (AAHPERD), National Health Education Standards

- Health Education Standard 1, Grades PK-12: Students will comprehend concepts related to health promotion and disease prevention

RESOURCES

This lesson plan was developed under a cooperative agreement awarded by the U.S. Environmental Protection Agency to the NEA Health Information Network (2007).

- EPA's *IAQ Tools for Schools* Action Kit, Reference Guide, Appendix M, Pages 79-84
- www.education-world.com
- www.wearablelessons.com

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